

## **Historic, archived document**

Do not assume content reflects current scientific knowledge, policies, or practices.





United States  
Department of  
Agriculture

Science and  
Education

576  
FOR OFFICIAL USE ONLY — INDEFINITE RETENTION

# 1983 Budget

## Explanatory Notes

Science and Education Agencies

Agricultural Research Service  
Cooperative States Research Service  
Extension Service  
National Agricultural Library

CONFIDENTIAL - JUNE 12, 1985

MAY 13 1987

USDA LIBRARY  
MAY 13 1987

### FOR OFFICIAL USE ONLY

Material prepared for use at  
Appropriation's Committee hearings  
must not be made public prior to  
release of printed Committee  
hearings.





## AGRICULTURAL RESEARCH SERVICE

### Purpose Statement

Agricultural Research Service was established on November 2, 1953, pursuant to authority vested in the Secretary of Agriculture by 5 U.S.C. 301 and Reorganization Plan No. 2 of 1953, and other authorities.

The research performed by Agricultural Research Service (ARS) is authorized by the Department of Agriculture Organic Act of 1862 (5 U.S.C. 511), the Research and Marketing Act of 1946, as amended (7 U.S.C. 427,427i), the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (P.L. 95-113), Agriculture and Food Act of 1981 (P.L. 97-98)

Agricultural Research Service is responsible for conducting basic, applied and developmental research of:

- Animal production
- Plant production
- Use and improvement of soil, water, and air
- Processing, storage, distribution, food safety, and consumer services
- Human nutrition research

The research applies to a wide range of goals; commodities; natural resources; fields of science; and geographic, climatic, and environmental conditions. It is categorized into 67 ARS National Research Programs and eight Special Research Programs.

As the U.S. Department of Agriculture's in-house agricultural research unit ARS has major responsibilities for conducting and leading the national agricultural research effort. ARS provides initiative and leadership in five areas:

- \* Research on broad regional and national problems.
- \* Research to support Federal action and regulatory agencies.
- \* Expertise to meet national emergencies.
- \* Research support for international programs.
- \* Scientific resource to the Executive Branch and Congress.

The mission of ARS research is to develop new knowledge and technology which will insure an abundance of high quality agricultural commodities and products at reasonable prices to meet the increasing needs of an expanding economy and to provide for the continued improvement in the standard of Living of all Americans. This mission focuses on the development of technical information and technical products which bear directly on the needs to (1) manage and use the Nation's soil, water, air, and climatic resources, and improve the Nation's environment; (2) provide an adequate supply of agricultural products by practices that will maintain a permanent and effective agriculture; (3) improve the nutrition and well-being of the American people; (4) improve living in rural America; and (5) strengthen the Nation's balance of payments.

Research is conducted at numerous field locations in the States, District of Columbia, Puerto Rico, the Virgin Islands, and in several foreign countries. Much of the work is conducted in direct cooperation with the State agricultural experiment stations, other State and Federal agencies, and private organizations.

Central offices of ARS are in the Washington, D.C. Metropolitan Area. The field activities are managed on a geographical basis through four Regional Offices, 14 Area Offices, and seven major Research Centers. Research activities are carried out at 147 separate field locations. As of September 30, 1981, there were 7,602 full-time employees and 1,195 part-time employees. Of the total 142 full-time employees and 9 part-time employees worked in the headquarters office.

AGRICULTURAL RESEARCH SERVICE

Available Funds and Staff-Years

Actual 1981, and Estimated 1982 and 1983

Item	Actual, 1981		Estimated Available: 1982		Budget Estimate 1983	
	Amount	Staff-Years	Amount	Staff-Years	Amount	Staff-Years
Direct Appropriation:						
Agricultural Research Service.....	\$418,099,000	8,525	\$ 425,678,000	8,508	\$468,548,000	8,458
Buildings & Facilities.....	- -	- -	8,596,000	- -	- -	- -
Total, Direct Appropriation.....	418,099,000	8,525	434,274,000	8,508	468,548,000	8,458
Deduct Allotments to other Agencies:						
Forest Service.....	-386,000	-2	-390,000	-2	-392,000	-2
Net.....	417,713,000	8,523	433,884,000	8,506	468,156,000	8,456
Obligations from other						
USDA Appropriations:						
Animal and Plant Health Inspection Service.....	2,216,908	65	2,311,000	46	2,311,000	46
Food Safety & Inspection Service.....	3,659,504	42	3,815,000	30	3,815,000	30
Miscellaneous Reimbursements.....	2,346,185	37	2,445,000	26	2,445,000	26
Total, Other USDA Funds.....	8,222,597	144	8,571,000	102	8,571,000	102
Total, Agriculture Appropriations.....	425,935,597	8,667	442,455,000	8,608	476,727,000	8,558
Other Federal Funds:						
Department of Defense.....	1,929,318	8	2,018,000	6	2,018,000	6
Department of Health and Human Services.....	1,325,549	5	1,386,000	4	1,386,000	4
Department of Energy.....	7,777,365	30	8,135,000	21	8,135,000	21
Environmental Protection Agency.....	1,869,590	8	1,955,000	5	1,955,000	5
Miscellaneous Reimbursements.....	1,710,376	6	1,787,000	4	1,787,000	4
Total, Other Federal Funds.....	14,612,198	57	15,281,000	40	15,281,000	40
Non-Federal Funds:						
State of Nebraska.....	63,880	1	64,000	1	64,000	1
North Dakota.....	235,429	2	235,000	2	235,000	2
California.....	358,561	3	359,000	3	359,000	3
International Institute of Tropical Agriculture: Cotton, Incorporated.....	61,122	1	61,000	- -	61,000	- -
Miscellaneous Reimbursements.....	63,336	1	63,000	- -	63,000	- -
Miscellaneous Contributed Funds.....	370,252	- -	372,000	- -	372,000	- -
Total, Non-Federal Funds.....	1,454,370	23	1,994,000	22	1,994,000	22
Total, Agriculture Research Service...	2,606,950	31	3,148,000	28	3,148,000	28
Total, Agricultural Research Service...	443,154,745	8,755	460,884,000	8,676	495,156,000	8,626

Full-Time Equivalent Staff-Years:	1981 Actual	1982 Estimated	1983 Estimated
Ceiling.....	8,607	8,600	8,550
Non-Ceiling.....	148	76	76
Total.....	8,755	8,676	8,626

# AGRICULTURAL RESEARCH SERVICE

## Permanent Positions by Staff-Year Summary

1981 Actual, 1982 Estimate and 1983 Estimate

Grade	1981 Actual			1982 Estimate			1983 Estimate		
	Headquarters	Field	Total	Headquarters	Field	Total	Headquarters	Field	Total
ES-6	2	--	2	2	--	2	2	--	2
ES-5	4	5	9	4	5	9	4	5	9
ES-4	6	22	28	6	22	28	6	22	28
ES-3	3	--	3	3	--	3	3	--	3
ES-2	--	5	5	--	5	5	--	5	5
ES-1	5	7	12	5	7	12	5	7	12
GS-17	2	2	4	2	2	4	2	2	4
GS-16	6	3	9	6	3	9	6	3	9
GS/GM-15	74	311	385	74	311	385	74	311	385
GS/GM-14	48	639	687	48	639	687	47	635	682
GS/GM-13	93	922	1,015	93	922	1,015	92	913	1,005
GS-12	99	802	901	99	802	901	98	795	893
GS-11	61	578	639	57	578	635	56	571	627
GS-10	1	13	14	1	13	14	1	13	14
GS-9	30	740	770	27	740	767	27	733	760
GS-8	5	157	162	5	157	162	5	157	162
GS-7	66	837	903	64	837	901	63	834	897
GS-6	150	338	488	150	338	488	150	338	488
GS-5	70	833	903	70	833	903	70	833	903
GS-4	49	478	527	48	478	526	48	478	526
GS-3	25	113	138	25	113	138	25	113	138
GS-2	--	15	15	--	15	15	--	15	15
GS-1	--	1	1	--	1	1	--	1	1

Positions at rates  
Established by  
act June 20, 1958:  
(5 U.S.C. 3104)...

	1		7		6		7		7
--	---	--	---	--	---	--	---	--	---

Permanent Positions by Grade and Staff-Year Summary

1981 Actual, 1982 Estimate and 1983 Estimate (Continued)

Grade	1981 Actual			1982 Estimate			1983 Estimate		
	Headquarters	Field	Total	Headquarters	Field	Total	Headquarters	Field	Total
Grade Established under Foreign National Pay Plan:	--	26	26	--	31	31	--	31	31
Ungraded Positions:	21	1,211	1,232	21	1,211	1,232	21	1,203	1,224
Total Permanent Positions.....	821	8,064	8,885	811	8,069	8,880	806	8,024	8,830
Staff-Years:									
Ceiling.....	608	7,999	8,607	728	7,812	8,600	720	7,830	8,550
Non-Ceiling.....	3	145	148	1	75	76	1	75	76
Total.....	611	8,144	8,755	729	7,947	8,676	721	7,905	8,626



AGRICULTURAL RESEARCH SERVICE

CLASSIFICATION BY OBJECTS

1981 and Estimated 1982 and 1983

	<u>1981 Actual</u>	<u>1982 Estimated</u>	<u>1983 Estimated</u>
Personnel Compensation:			
Headquarters.....	\$ 15,369,000	\$ 19,410,000	\$ 19,389,000
Field.....	<u>194,373,000</u>	<u>200,309,000</u>	<u>202,257,000</u>
11 Total Personnel Compensation.....	209,742,000	219,719,000	221,646,000
12.0 Personnel Benefits.....	22,012,000	22,962,000	23,161,000
Total Pers. Comp. & Benefits..	<u>231,754,000</u>	<u>242,681,000</u>	<u>244,807,000</u>
Other Objects:			
21.0 Travel and transportation of persons.....	4,696,000	4,457,000	4,773,000
22.0 Transportation of things.....	927,000	1,254,000	1,430,000
23.1 Standard level user charges.....	2,532,000	3,024,000	3,021,000
23.2 Communications, utilities and other rent.....	21,154,000	24,043,000	27,415,000
24.0 Printing and reproduction.....	1,933,000	2,228,000	2,541,000
25.0 Other services.....	67,243,000	69,123,000	94,775,000
26.0 Supplies and materials.....	37,088,000	42,187,000	48,104,000
31.0 Equipment.....	25,762,000	29,293,000	31,368,000
32.0 Lands and structures.....	8,174,000	24,913,000	14,190,000
41.0 Grants, subsidies, and contributions.....	1,020,000	1,020,000	1,020,000
42.0 Insurance claims & Indemnities.....	<u>160,000</u>	<u>- -</u>	<u>- -</u>
Total other objects.....	<u>170,689,000</u>	<u>201,542,000</u>	<u>228,637,000</u>
Total obligations.....	<u>402,443,000</u>	<u>444,223,000</u>	<u>473,444,000</u>
Position Data:			
Average Salary, ES positions	\$ 50,112	\$ 58,000	\$ 58,000
Average Salary, GS positions	\$ 26,570	\$ 27,845	\$ 27,845
Average Grade, GS positions	9.42	9.42	9.42
Average Salary of Ungraded positions.....	\$ 19,128	\$ 20,046	\$ 20,046



## AGRICULTURAL RESEARCH SERVICE

The estimates include proposed changes in the Language of this item as follows: (new language underscored; deleted matter enclosed in brackets).

### Agricultural Research Service

- For necessary expenses to enable the Agricultural Research Service to perform agricultural research and demonstration relating to production, utilization, marketing, and distribution (not otherwise provided for), home economics or nutrition and consumer use, and for acquisition of lands by donation, exchange, or purchase at a nominal cost not to exceed \$100, [432,410,000] \$468,548,000; Provided, That appropriations hereunder shall be available for field employment pursuant to the second sentence of section 706(a) of the Organic Act of 1944 (7 U.S.C. 2225), and not to exceed \$115,000 shall be available for employment under 5 U.S.C. 3109: Provided further, That funds appropriated herein can be used to provide financial assistance to the organizers of international conferences, if such conferences are in support of agency programs: Provided further, That appropriations hereunder shall be available for the operation and maintenance of aircraft and the purchase of not to exceed one for replacement only: Provided further, That of the appropriations hereunder not less than \$10,526,600 shall be available to conduct marketing research: Provided further, That appropriations hereunder shall be available pursuant to 7 U.S.C. 2250 for the construction, alteration, and repair of buildings and improvements, but unless otherwise provided the cost of constructing
- 1 any one building shall not exceed [100,000] \$115,000, except for headhouses connecting greenhouses which shall each be limited to \$500,000, and except for ten buildings to be constructed or improved at a cost not to exceed [185,000] \$223,000 each, and the cost of altering any one building during the fiscal year shall not exceed 10 per centum of the current replacement value of the building or [100,000] \$115,000, whichever is greater: Provided further, That the limitations on alterations contained in this Act shall not apply to a total of \$100,000 for facilities at Beltsville, Maryland: Provided further, That the foregoing limitations shall not apply to replacement of buildings needed to carry out the Act of
  - 2 April 24, 1948 (21 U.S.C 113a)[ : Provided further, That the foregoing limitations shall not apply to purchase from Colorado State University Research Foundation of approximately 160 acres within the boundaries of the Central Plains Experimental Range, Nunn, Colorado, for not to exceed \$115,000].
  - 3 [Special fund: To provide for additional labor, subprofessional, and junior scientific help to be employed under contracts and cooperative agreements to strengthen the work at Federal research installations in the field, \$2,000,000.]

### Explanation of Changes

The first change would increase the cost limitation on (1) construction of any one building (except headhouses connecting greenhouses) from \$100,000 to \$115,000; (2) construction of ten buildings from \$185,000 to \$223,000 each; and (3) altering any one building during the fiscal year from \$100,000 to \$115,000.

The construction cost limitation on buildings should be increased in fiscal year 1983 to maintain the previous values of these authorizations. The escalation from October 1981 to October 1982 for small and specialized facility construction was approximately 15 percent.

The second change proposes deletion of language authorizing purchase of land from the Colorado State University Research Foundation. The land will be purchased in FY 1982, and the language will not be required in FY 1983.

The third change proposes deletion of language pertaining to the use of Special Funds. These funds will be merged with the regular Agricultural Research Service appropriation, and specific language will not be required in FY 1983.



AGRICULTURAL RESEARCH SERVICE

Appropriation Act, 1982.....	\$434,410,000a/
Budget Estimate, 1983.....	468,548,000
Increase in appropriation.....	<u>+\$34,138,000</u>

Adjustments in 1982:

Appropriation Act, 1982.....	\$434,410,000
Transfer to Human Nutrition	
Information Service.....	<u>-8,732,000 b/</u>
Adjusted base for 1983.....	\$425,678,000
Budget Estimate, 1983.....	468,548,000
Increase over adjusted 1982.....	<u>+\$42,870,000</u>

a/ Includes \$2,000,000 Special Fund for additional labor, subprofessional and Junior scientific help in the field.

b/Functions associated with the Consumer Nutrition Center and the Human Nutrition Information and Dietary Guidance Division were transferred to the Human Nutrition Information Service in 1982.

SUMMARY OF INCREASES AND DECREASES  
(On basis of appropriation)

<u>Item of Change</u>	<u>1982 Estimated</u>	<u>Program Changes</u>	<u>1983 Estimated</u>
Expanded basic agricultural research...	195,327,000	+\$9,600,000	\$204,927,000
Animal health and protection research..	19,468,000	+4,000,000	23,468,000
Range and pasture research.....	6,232,000	+500,000	6,732,000
National plant germplasm resources.....	9,302,000	+3,800,000	13,102,000
National Arboretum security.....	385,000	+250,000	635,000
Tropical and subtropical research.....	3,715,000	-2,980,000	735,000
Research on acid precipitation.....	110,000	+869,000	979,000
Research on the conservation and use of land and water resources.....	11,803,000	+5,100,000	16,903,000
Human nutrition research.....	25,206,000	+1,000,000	26,206,000
All Other.....	<u>154,130,000</u>	<u>+20,731,000a/</u>	<u>174,861,000</u>
Total Available.....	<u>\$425,678,000</u>	<u>\$+42,870,000</u>	<u>\$468,548,000</u>

a/ Includes a proposed increase of \$7,231,000 toward increased operating costs in order to sustain performance levels for continuing programs; and an increase of \$13,500,000 to restore the pay costs absorbed in FY 1982 but are necessary to carry out the program proposed for FY 1983.

PROJECT STATEMENT  
(On basis of appropriation)

Project	1981		1982 (estimated)		Increase or Decrease	1983 (estimated)	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
1. <u>Research on animal production:</u>							
(a) <u>Animal production efficiency re-</u>							
search.....	\$76,004,041	1,691	\$79,648,000	1,668	+\$11,108,000	\$90,756,000	1,658
(b) <u>Research on housing.....</u>	546,120	8	496,000	10	+21,000	517,000	10
Total, Research on animal production...	76,550,161	1,699	80,144,000	1,678	+11,129,000(1)	91,273,000	1,668
2. <u>Research on plant production:</u>							
(a) <u>Plant production efficiency re-</u>							
search.....	154,075,768	3,421	164,201,000	3,431	+19,059,000a/	183,260,000	3,419
(b) <u>Tropical/Sub-tropical agri-</u>							
cultural Research:	2,460,084	9	3,715,000	9	-3,715,000a/	- -	- -
Total, Research on plant production....	156,535,852	3,430	167,916,000	3,440	+15,344,000(2)	183,260,000	3,419
3. <u>Research on the use and improvement of soil, water and air:</u>							
(a) <u>Research on con-</u>							
servation and use of land and water resources and maintaining environmental quality.....	38,591,238	824	41,134,000	869	+6,480,000	47,614,000	864
(b) <u>Research on watershed dev-</u>							
elopment.....	12,759,168	303	13,995,000	314	+2,602,000	16,597,000	312
Total, Research on the use and improve-							
ment of soil, water and air.....	51,350,406	1,127	55,129,000	1,183	+9,082,000(3)	64,211,000	1,176
4. <u>Processing, storage distribution, food safety &amp; consumer services research:</u>							
(a) <u>Processing, storage and distribution efficiency re-</u>							
search.....	53,849,108	1,367	57,891,000	1,373	+2,523,000	60,414,000	1,365
(b) <u>Research to expand agri-</u>							
cultural exports:	2,123,234	52	2,345,000	48	+135,000	2,480,000	48
(c) <u>Research to im-</u>							
prove human health and safety.....	23,145,774	515	24,639,000	515	+1,811,000	26,450,000	512
(d) <u>Research on con-</u>							
sumer services..	696,797	20	692,000	22	+32,000	724,000	22
Total, Processing, storage and distri-							
bution, food safety, and consumer ser-							
vices research.....	79,814,913	1,954	85,567,000	1,958	+4,501,000(4)	90,068,000	1,947
5. <u>Research on human nutrition.....</u>	24,790,405	315	25,206,000	249	+2,438,000(5)	27,644,000	248
6. <u>Repair and maint-</u>							
<u>enance of facilities and energy retrofit</u>	10,598,232	--	10,716,000	--	+376,000(6)	11,092,000	- -

Project	1981		1982 (estimated)		Increase or Decrease	1983 (estimated)	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
7. Construction of facilities.....	12,100,000	--	--	--	--	--	--
8. Contingency Research: Fund.....	1,000,000	--	1,000,000	--	--	1,000,000	--
Unobligated balance	5,359,031	--	--	--	--	--	--
Total available or estimate.....	418,099,000	8,525	425,678,000	8,508	+42,870,000	468,548,000	8,458
	b/:						
Transfer To HNIS....	+8,732,000	--	+8,732,000	--			
TOTAL, APPROPRIATION:	426,831,000	8,525	434,410,000	8,508			

a/ Of the total Tropical-Subtropical funds available in FY 1982, \$2,980,000 is recommended for transfer to the Cooperative State Research Service Appropriation in FY 1983. The funds remaining, \$735,000, are available for inhouse research and will be merged with the Plant Production Efficiency Program.

b/ Includes \$999,173 unobligated balance.

## AGRICULTURAL RESEARCH SERVICE

### Explanation of Program

Under the Agriculture, Rural Development and Related Agencies Appropriation Act of 1982, Agricultural Research Service carries out the following activities:

1. Research on animal production. -- Research is conducted to improve live-stock (including poultry) productivity and to improve the quality of meat and livestock products through improved breeding, feeding, and management practices. Research is conducted to develop methods for controlling diseases, parasites, and insect pests affecting livestock. Research is also conducted on ways to reduce rural housing construction and operating costs and on ways to control insects affecting man.
2. Research on plant production. -- Research is conducted to improve plant productivity through improved varieties of food, feed, fiber, and other plants; develop new crop resources; and improve crop production practices, including methods to control plant diseases, nematodes, insects, and weeds.
3. Research on the use and improvement of soil, air, and water. -- Research is conducted to improve the management of natural resources, including investigations to improve soil and water management, irrigation and conservation practices; to protect natural resources from harmful effects of soil, water, and air pollutants, and to minimize certain agricultural pollution problems; and to determine the relation of soil and water to plant growth, including impact on animal and human nutrition. The research includes studies on hydrologic problems of agricultural watersheds, and the application of remote sensing techniques in solving agricultural problems.
4. Processing, storage and distribution, food safety and consumer services research. -- Research is conducted to provide a basic reservoir of knowledge which will stimulate technological development and innovation in the processing, storage, and distribution of food and feeds and thereby improve productivity and reduce costs to the consumer. The research additionally provides support to the regulatory agencies in assuring the quality, safety, and nutrition of food and fiber, and in grading to facilitate movement in commerce and export. Research is conducted to reduce losses in post harvest handling of agricultural commodities including control of insects in storage and quality in export. Research is conducted on utilization of commodities, by-products, wastes and agricultural biomass as chemicals, alternative fuels and other critical materials.
5. Human nutrition research -- Research is conducted on human nutritional requirements and the composition and nutritive value of food as needed by consumers, and by Federal, State and local agencies administering food and nutrition programs.

The research performed by Agricultural Research Service is authorized by the Department of Agriculture Organic Act of 1862 (5 U.S.C. 511), the Research and Marketing Act of 1946, as amended (7 U.S.C. 427, 427i) and the Agriculture Food Act of 1981 (P.L. 97-98).



JUSTIFICATION OF INCREASES AND DECREASES

(1) An increase of \$11,129,000 for research on animal production efficiency consisting of:

- (a) An increase of \$2,662,000 to restore pay costs absorbed in FY 1982.
- (b) An increase of \$3,100,000 in basic animal research (\$5,500,000 available in FY 1982).

Need for Change: The lack of basic knowledge concerning the metabolic mechanisms of farm animals limits animal productivity. Before we can make substantial progress in animal production, more information is needed on the endocrinological and cellular control of reproduction, the absorption, assimilation and utilization of nutrients, the cellular control of protein synthesis and fat disposition, the mechanics of cell-mediated immune response, and how these processes can be manipulated.

Disease losses are a significant impediment to animal production efficiency. Diseases are controlled largely through the use of chemicals, antibiotics or vaccines. Many of these methods are becoming ineffective or are associated with residue problems. To overcome some of these problems, it will be necessary to increase our knowledge of the body's own defense to diseases. This will provide the basis for improved vaccines, use of natural body defenses, and development of animals that are genetically resistant to disease.

Because the time lapse is so great between the initiation of fundamental research and the ultimate adoption of improved practices by producers, it is urgent that additional basic research on animal metabolism be initiated soon. Unless this work proceeds rapidly and succeeds, the technical options for overcoming current production constraints will be severely limited and we may not be able to respond to projected demands.

Nature of Change: Increases in animal productivity are dependent on improvements in three major areas; reproduction efficiency, feed utilization efficiency and disease control. Examples of research which will be conducted are as follows: (1) Hormonal and enzymatic balances affecting embryonic survival, (2) Factors affecting nutrient utilization and absorption including identification of neural and humoral factors and chemoreceptors important in digestion and absorption and factors impacting cellulose conversion in ruminants, (3) Increasing disease resistance through cell mediated immunity and (4) Controlling fat deposition and distribution genetically. In addition, research will be continued on genetic resistance to disease and effects of environmental and nutritional stress on the immune system. New immunological techniques will be adapted to study genetic resistance to disease, to study immune response to pathogens, and to develop improved methods to diagnose disease agents.

- (c) An increase of \$4,000,000 for animal health and protection research, (\$19,468,000 available in FY 1982).

Need for Change: Animal products supply three-fourths of the protein, one-third of the energy, and substantial amounts of vitamins and minerals in the American diet. The prevention and control of animal diseases are essential to assure an adequate supply of animal products, as we are approaching the limits of our farm resources;

therefore, the increase in animal production must come from the 15 to 20 percent of farm animals that currently die before reaching market in the United States. These losses, plus growth inefficiencies and treatment cost of animals that recover from illnesses, are equal to an estimated 25 percent of the annual farm income from livestock and poultry products, or \$15 billion per year. The losses in the United States are generally not due to highly contagious diseases but to production diseases, many of which produce no recognizable clinical symptoms. As a class, the production diseases are complex epidemiologically and have infectious, toxic, and genetic metabolic and nutritional etiology or combinations thereof. They generally result from several etiological factors acting in concert with environmental and production factors.

Labor, investment, and facility costs, plus market competition, have required that large numbers of animals be kept closely confined. Even though there are many health advantages in this practice, i.e., health surveillance; protection from parasites, predators, and climatic extremes; and accessibility for better health care, the spread of certain diseases is enhanced by the proximity of animals in a group. Feed additives, pesticides, and antibiotics have been depended upon to control animal health hazards under these conditions. Because of public concern, regulatory action is reducing or eliminating the use of these products. New or altered technology must be developed to combat new diseases or to replace measures no longer permitted or no longer effective.

Nature of Change: The research will primarily be done via cooperative agreements with universities. In addition, some of the research will be done at ARS laboratories. It will center on solutions to health problems in domestic food animals and will seek causes, means of prevention, control or eradication of major infectious and metabolic diseases, parasites, insects, and other hazards to health of food animals. The research will employ recent technological advances such as genetic engineering, cell mediated immunity, monoclonal antibodies, and subunit vaccines. Major efforts center on respiratory, enteric, and reproductive diseases, as well as mastitis, external and internal parasite control, toxic hazards, and numerous other health problems encountered in the production of cattle, swine, poultry, sheep, horses, and fish.

- (d) An increase of \$1,367,000 to provide increased operating costs in animal production efficiency research.

Need for Change: Additional funding is essential to maintain the current level of program effort in animal productivity and animal protection research and to improve the efficiency of producing high quality animals and animal products. Costs of fuel, supplies, equipment, utilities, and other items used by researchers have risen sharply in recent years. The additional funds requested will provide some relief in meeting these increased costs and ensure that high priority research programs are not seriously disrupted.

Nature of Change: This increase will undergird facilities and staff operations. It will support ongoing programs and allow managers the flexibility to address crucial priority issues and respond to unanticipated problems of national importance.

- (2) An increase of \$15,344,000 for research on plant production efficiency consisting of:

- (a) An increase of \$5,633,000 to restore pay costs absorbed in FY 1982.



- (b) An increase of \$1,300,000 for basic research on host pest interaction mechanisms (IPM) (\$3,900,000 available in FY 1982).

Need for Change: Losses from pests, insects, plant diseases, nematodes, and weeds continue to persist at approximately 30 percent of potential agricultural production or about \$35 billion annually.

Clearly, improved technology is needed to selectively prevent the development of pests without damaging or placing stress on crops, livestock, or on beneficial organisms.

For more than a decade industry has progressively diverted resources from basic innovative research to research needed to defend registrations of pesticides.

In addition, society now requires that pest control technology meet higher standards of safety and ecological selectivity than in past decades. Thus, there is a critical need to greatly increase fundamental knowledge of the vulnerabilities in the life cycles and physiological processes of pests and especially in their interactions with crops and with beneficial organisms. Such knowledge will assist industry in fashioning a new generation of pest control technology.

Nature of Change: Scientists at more than one dozen locations will undertake research on the mechanisms that crops use to mitigate pest attack, the manner whereby hormones control the activities of genes and membranes in pests, the genetic basis of resistance to pesticides, and of the development of new virulent strains, sensing and communication mechanisms in pests, vulnerable stages in life cycles and the use of genetic engineering and tissue culture to develop resistant crop germplasm and improved natural enemies.

- (c) An increase of \$4,425,000 for basic research in gene manipulation, plant metabolism, and biophysical mechanisms (\$1,600,000 available in FY 1982).

Need for Change: Improved crop productivity from land, labor, capital, water, and energy inputs is essential to reduce inflationary pressures on both the consumer and producer, strengthen export capability, and help maintain an effective and efficient food and agricultural system. This program supports that objective. Introduction of improved plant varieties and cultural practices has contributed to increasing crop yields during the past 50 years. During the last decade, however, the annual rate of increase of crop productivity has declined. For the six major grain crops, the average yearly yield increase during the period from 1930 to 1969 was 2.9 percent, whereas the average yearly yield increase during the 1970's was only 1.4 percent. Similar reductions in the rate of increased yield for other crops have been noted. Productivity can be increased only if new technologies become available to farmers. Basic research in agriculture is a necessary prerequisite to the development of the needed improved varieties and management practices. At present, the pool of basic knowledge is being rapidly depleted. We must invest in basic biological science today to be able to provide for tomorrow's domestic and export needs of food and fiber.

Investment in fundamental research has a low potential for payout unless the effort can achieve critical mass and be sustained for a reasonable time period. Genetic engineering knowledge is increasing

in the scientific community. This requires a substantial and growing capability to exploit this burgeoning science by application to agricultural problems. The Department has initiated an orderly stepwise development of capability to respond to the national needs for innovative agricultural science and technology. It is essential to continue this process.

Nature of Change: The following lines of work will be strengthened:

- (1) Plant metabolism and biophysical mechanisms: Physical and metabolic responses to environmental stress (water, mineral, and thermal); membrane research related to water and nutrient transport; energy conversion, bioregulation, and translocation; and heritable linkage of the above characteristics in agronomic crop germplasm.
- (2) Gene transfer through the use of recombinant (engineered) DNA molecules to alter the value of crops and to improve their utilization as food, feed, fuel, and chemical feedstocks. The objective is to develop methodologies to control gene transfer and gene expression in organisms of agricultural importance.

The Department is building and maintaining a critical mass of scientific experts, equipment, and facilities for conducting fundamental research studies on all aspects of plant growth and production. This increase will provide new expertise and techniques to strengthen and enhance the productivity of the existing research teams.

- (d) An increase of \$500,000 for improving range and pasture plants and production through breeding and application of ecological principles (\$6,232,000 available in FY 1982).

Need for Change: Consumer demand for leaner red meat and rising energy costs will increase the demand for production from pasture and range. Direct harvesting of feed by livestock requires minimum petroleum input and produces food on land unsuited to crop production. Increasing demand will require improved native range species that can be easily established, and which are productive in arid environments. New and improved management practices must be developed based on sound ecological principles compatible with increased sustained production.

Nature of Change:

Increased funding will be used for increasing effort to:

- Develop superior native range plant species.
- Develop integrated range management systems based on sound ecological principles.
- Develop models to aid in range management decisions and identification of research needs.

- (e) An increase of \$3,800,000 for research on plant germplasm (\$9,302,000 available in FY 1982).

Need for Change: Plant germplasm is the base for a productive agriculture. Genetic diversity (germplasm) is imperative if breeders are to develop new, unique and productive crops for insuring a



stable, plentiful supply of food, feed and fiber with desirable quality and at least cost to farmers. The National Plant Germplasm System, a national network of public and private workers and facilities, is the steward for this irreplaceable resource in the United States. An effective germplasm program is a continuum from acquisition of genetic material; through maintenance, development, conservation of genetic resources; to the dissemination of information. It also involves monitoring of genetic vulnerability of crops on farmers' fields and the development of early-warning systems to minimize losses to insects, diseases and abnormal weather patterns. This increase in funding will provide the means for acquiring, preserving, evaluating and using our plant germplasm heritage now and for future generations. Without such an increase, valuable germplasm will be irretrievably lost.

Nature of Change: Increased funding will be used to provide support to the National Plant Germplasm System activities within the crop productivity program. All germplasm projects involve joint planning, assessment and review among State, Federal, and the private sector institutions to assure that valuable seed and clonal materials are effectively protected and utilized. Specific use of these funds will be to acquire new germplasm, improve maintenance of germplasm, develop improved genetic stocks, carry out research on conservation of genetic diversity, and manage a national, computer-assisted information network for germplasm.

- (f) An increase of \$250,000 for improving security at the U.S. National Arboretum (\$385,000 available in FY 1982).

Need for Change: Existing facilities and support personnel at the National Arboretum in Washington, D.C., are inadequate to provide the necessary security that is essential to safeguard the visiting public and protect U.S. Government property and irreplaceable plant specimen possessions of the National Arboretum. Vandalism and other crimes against persons and property at this location have resulted in substantial property losses and damage as well as major assaults and injuries to the visiting public.

Nature of Change: The increase of \$250 thousand will provide for necessary security both in terms of physical improvements at the U.S. National Arboretum and development and strengthening of the security staff. It will also provide for the complete renovation of a 30 year old perimeter fencing system for additional security and safety of visitors and plant specimens.

- (g) An increase of \$2,416,000 to provide increased operating costs in plant production efficiency research.

Need for Change: Additional funding is essential to maintain the current level of program effort in crop productivity and crop protection research to improve the quality and production efficiency of food, feed, forage and fiber crops; florist and nursery crops; rangelands and turfs. Costs of fuel, supplies, equipment, utilities, and other items used by researchers have risen sharply in recent years. The additional funds requested will provide some relief in meeting these increased costs and ensure that high priority research programs are not seriously disrupted.

Nature of Change: This increase will undergird facilities and staff operations. It will support ongoing programs and allow managers the flexibility to address crucial priority issues and respond to unanticipated problems of national importance.

- (h) A decrease of \$2,980,000 for tropical-subtropical research (\$3,715,000 available in FY 1982).

Need for Change: The Agricultural Research Service conducts tropical-subtropical research generally under the Organic Act of 1862 and the Research and Marketing Act of 1946, as amended. Further, specific authority for this research is provided under Section 406 of the Agricultural Trade, Development and Assistance Act of 1954 as amended by the Food for Peace Act of 1966. The research primarily involves two regions, the Caribbean and Pacific Basins. The Land Grant Universities and the Basin Advisory Groups, together with the National Advisory Group, ultimately decide, with Department oversight, the research to be done and the allocation of tropical-subtropical funds, using a peer-review process. This research funding can be more effectively administered by the Cooperative State Research Service through their Special Research Grants Appropriation.

Nature of Change: The Agricultural Research Service is recommending a decrease of \$2,980,000 within its current appropriation for tropical-subtropical research. The Agency will continue to perform tropical-subtropical research within its in-house locations with the balance of funding appropriated for these purposes, \$735,000. The Cooperative State Research Service is requesting an increase in the amount of \$2,980,000 in the 1983 Budget to continue this research.

- (3) An increase of \$9,082,000 for research on conservation of land, water, and air resources and watershed development consisting of:

- (a) An increase of \$1,789,000 to restore pay costs absorbed in FY 1982.
- (b) An increase of \$375,000 for basic research on plant metabolism involving plant response to water, mineral, and thermal stresses (\$2,500,000 available in FY 1982).

Need for Change: Environmental factors account for much of the difference between actual and potential crop yields. Future increases in crop yield per unit of land and water will be dependent on identifying and overcoming environmental factors currently restraining crop yields.

Nature of Change: The increased funding is for identifying mechanisms controlling salinity tolerances and plant response to water, mineral, and thermal stresses found in field environments, and bioregulatory mechanisms controlling transpiration from plant canopies to the atmosphere.

- (c) An increase of \$869,000 for research on the effect of acid precipitation on plant growth and soil productivity (\$110,000 available in FY 1982).

Need for Change: Acid rain has become an important national and international issue in the last 10 years. The harmful impact of acid rain on aquatic systems has been documented. The impact of acid precipitation on crop production and on long-term soil productivity is not known. Research is needed to assess the long-term effects of acid

rain on crop production and soil productivity so that potential losses can be estimated and a sound scientific basis can be provided for corrective measures, if such measures are needed.

Nature of Change: The limited program initiated by ARS in 1982 to evaluate the effect of stress from air pollutants on plant production will be expanded. Research on the mode of action of various pollutants on plant growth and the effect of various concentrations of pollutants in acid rain on crop production will be determined. The impact of long-term additions of acidic pollutants to soils on soil chemical and biological reactions will be determined, and the long-range effect of acid rain on soil productivity will be assessed.

- (d) An increase of \$600,000 for research on salinity control in the Colorado River Basin (\$336,000 available in FY 1982).

Need for Change: The United States has made a commitment to Mexico to deliver water at an agreed-to quality level. Furthermore, the Colorado Basin States have negotiated standards with EPA which will require reduction of 2.8 million tons of salt-loading to the Colorado River. About 37 percent of the Upper Basin's present salt load comes from approximately 1 million acres of irrigated cropland, most of which will be involved in a USDA on-farm implementation program scheduled to be completed by 1994. Balance and coordination of research, extension, and service elements of the program, from planning to full implementation, are essential to success. Insufficient or delayed research could seriously impede the implementation program and make it more difficult to meet our treaty obligation to Mexico. Delayed research also will impede benefits to downstream agricultural, municipal, and industrial water users within the United States.

Nature of Change: Increased funding will be used to: (1) devise and test new on-farm irrigation systems and practices to reduce salt-loading, (2) develop technology to economically improve off-farm distribution systems to reduce deep percolation losses, (3) determine methodology to reduce leaching fractions and minimize return flow salt loading without reducing yields, and (4) develop beneficial uses for brackish waters.

- (e) An increase of \$1,600,000 for research to optimize water use in agriculture, to augment agricultural water supplies and to maintain water quality (\$7,585,000 available in FY 1982).

Need for Change: Water is the primary limiting factor in crop production and the major cause of production instability. The groundwater overdrafts already are threatening future crop production levels in several important agricultural regions, and because competition for available water from urban and industrial users will reduce future water supplies to agriculture, better ways of managing the Nation's diminishing water resources must be found. Technological improvements in water management and strategies for augmenting agricultural water supplies are of utmost importance if national goals for agricultural production and exports are to be met. Programs are needed to expand the use and reuse of low quality water in agriculture while ensuring that the quality of underlying groundwater is not seriously impaired. Supplemental irrigation is expanding rapidly in the Midwest and the Southeast to overcome the adverse effects of summer drought. Irrigation scheduling strategies tailored to the special needs of humid regions are needed to maximize the benefits of supplemental irrigation. Implementation of effective



and economical management programs and practices for pollution control requires technology to assess large scale impacts of conservation practices on water quality.

Nature of Change: This increase will be used to (1) develop procedures for using and reusing low quality water in agriculture, (2) develop effective systems for using surface and groundwater storage, (3) develop supplemental irrigation and controlled drainage systems for humid areas, (4) develop systems for optimizing use of limited water supplies in both irrigated and dryland agriculture, (5) evaluate alternative snow management practices for increasing water supplies, (6) assess the impact of increased competition for water on future crop production, (7) develop improved conveyance, control, and measurement systems for agriculture, and (8) evaluate farm management practices on water quality of river basins.

- (f) An increase of \$2,900,000 to evaluate the effect of soil erosion on soil productivity in support of the Soil Conservation Service (SCS) and the Resource Conservation Act (RCA) (\$3,882,000 available in FY 1982).

Need for Change: Very little research effort has been devoted to the effects of soil erosion on soil productivity. Some data are available that demonstrate that soil erosion can drastically reduce crop yields. However, there are insufficient data to develop a generally applicable relationship because only a fraction of the U.S., and usually only a few years of climatic variation, are represented. Even using long-term data, it would currently be difficult to develop a meaningful empirical relationship because the effect of soil erosion on soil productivity is masked by other inputs such as new and more productive crop varieties, improved soil management skills, fertilizers, pest control and other technical advances in materials and equipment.

A prime objective of soil conservation programs and of the Resource Conservation Act (RCA) is to reduce erosion to the T-value (tolerance level) or less on cropland, range, and non-Federal forestland and pastureland. Currently, limited research is underway, as are planning efforts on a coordinated field research program and initial modeling efforts. This increase will materially assist in accomplishing these objectives of: (1) quantifying the relationship between erosion and crop yields, thus permitting an economic evaluation of the value of lost topsoil, (2) improving prediction equations for water and wind erosion and, therefore, improving the accuracy of statistics on erosion, and (3) developing conservation tillage systems and associated erosion control practices to meet the RCA objectives of reducing erosion.

Nature of Change: The increased funding will be used to: (1) conduct nationwide field experiments to determine the effects of soil erosion on soil productivity, (2) develop models to predict the effect of erosion on soil productivity and the effect of management practices (tillage, fertility, erosion control, etc.) on crop yields and long-term soil productivity, (3) develop conservation tillage systems applicable to a wide range of crop residue and potential soil erodibility conditions, and (4) improve the accuracy and range of application of models for predicting water and wind erosion through a sound theoretical understanding of the basic mechanics of erosion.

- (g) An increase of \$949,000 to provide increased operating costs in research on conservation and use of soil, water and air resources.

Need for Change: Additional funding is essential to maintain the current level of program effort in research to improve the cropland, watershed, rangeland, and non-cultivated areas of the U.S. Costs of fuel, supplies, equipment, utilities, and other items used by researchers have risen sharply in recent years. The additional funds requested will provide some relief in meeting these increased costs and ensure that high priority research programs are not seriously disrupted.

Nature of Change: This increase will undergird facilities and staff operations. It will support ongoing programs and allow managers the flexibility to address crucial priority issues and respond to unanticipated problems of national importance.

- (4) An increase of \$4,501,000 for research in processing, storage, distribution, food safety and consumer services research consisting of:

- (a) An increase of \$2,788,000 to restore pay costs absorbed in FY 1982.
- (b) An increase of \$400,000 for basic research for support of Food Safety and Inspection Service (FSIS) programs (\$350,000 available in FY 1982).

Need for Change: Because of increasing concern about the safety and quality of the food supply, FSIS needs research support to expand their technical basis for decision-making and program monitoring. The Department is committed to responding to the research needs of action agencies and ARS is the principal research provider. Basic information about factors that affect food safety and food preservation is needed. Fundamental information on protection of food from salmonella contamination is needed to develop improved control systems to reduce the risk of human exposure to these pathogenic microorganisms. Basic information on the functions of sodium in food safety and food processing is required to advise industry of safe, acceptable means for reducing the quantities of sodium added to foods during processing. These needs are among the highest priority for FSIS.

Nature of Change: Fundamental research will be directed to developing information on thermal death requirements for salmonella organisms and the mechanisms of attachment of salmonella organisms to food and equipment surfaces. Basic research will be conducted to clarify the role of sodium in relation to other food components affecting food safety and product processability. The effects of various factors in the food will be studied to identify critical points in the safe processing of foods.

- (c) An increase of \$1,313,000 to provide increased operating costs in processing, storage, distribution, food safety and consumer services research.

Need for Change: Additional funding is essential to maintain the current level of program effort in Post Harvest Science and Technology research involving food quality and safety; technology and safety in non-food areas and the processing, distribution and export

of agricultural products. Costs of fuel, supplies, equipment, utilities, and other items used by researchers have risen sharply in recent years. The additional funds requested will provide some relief in meeting these increased costs and ensure that high priority research programs are not seriously disrupted.

Nature of Change: This increase will undergird facilities and staff operations. It will support ongoing programs and allow managers the flexibility to address crucial priority issues and respond to unanticipated problems of national importance.

(5) An increase of \$2,438,000 for human nutrition research consisting of:

- (a) An increase of \$628,000 to restore pay costs absorbed in FY 1982.
- (b) An increase of \$1,000,000 for research on nutritional status assessment (\$25,206,000 available in FY 1982).

Need for Change: There is still inadequate knowledge of nutrient needs of people at different ages; their level of physical activity and health status, and the consequences of inadequate or excessive levels of nutrient intake. Human nutrition research programs are guided in part by developing knowledge of population needs and consumption patterns. New and better methods are needed for measuring nutritional status, and for studying nutrient requirements in human subjects. There is also a need for precise, convenient and rapid methods to detect individuals who do suffer from malnutrition. In summary, a program is needed to develop methodology which will permit the acquisition of research knowledge to improve our capabilities for nutritional status assessment.

Nature of Change: Scientists in the USDA laboratories in the Western Human Nutrition Research Center at the Letterman Army Institute of Research (LAIR) will collaborate with other institutions in the conduct of this research. The approaches used in the research will include the study of human volunteers living under metabolic ward conditions as well as field pilot surveys designed to test methodology. In addition, there will be studies using experimental animal models.

- (c) An increase of \$810,000 to provide increased operating costs in human nutrition research.

Need for Change: Additional funding is essential to maintain the current level of program effort in research involving human nutrition. Costs of fuel, supplies, equipment, utilities, and other items used by researchers have risen sharply in recent years. The additional funds requested will provide some relief in meeting these increased costs and ensure that high priority research programs are not seriously disrupted.

Nature of Change: This increase will undergird facilities and staff operations. It will support ongoing programs and allow managers the flexibility to address crucial priority issues and respond to unanticipated problems of national importance.



(6) An increase for repairs, maintenance and retrofit of \$376,000 (\$10,716,000 available in FY 1982).

(a) An increase of \$288,000 for repair and maintenance of facilities (\$8,216,000 available in FY 1982).

Need for Change: The facilities used in ARS research comprise a complex of specialized facilities, the proper upkeep of which is essential to the conduct of research, and to the efficient preservation of invested building capital. The cost of repair and maintenance of facilities has outpaced the inflationary rise of many other expenses, yet no increase in funds has been provided for these purposes since the inception of this program in 1977-78.

Nature of Change: The requested increase would permit ARS to continue to carry out repair and maintenance of in-house laboratories at an effective level.

(b) An increase of \$88,000 to retrofit existing ARS facilities with cost-effective energy conservation measures (\$2,500,000 available in FY 1982).

Need for Change: In an effort towards compliance with the retrofit requirements of the National Energy Conservation Policy Act (P.L. 95-619), as well as the 20 percent reduction in energy consumption required by Executive Order 12003 by 1985, a preliminary 6-year Retrofit Program was established in FY 1979. The Program consists of work phases involving energy surveys, design, and installation of energy conservation measures to effect energy efficiency in approximately 2,906 buildings. It involves such things as installation of steam coils, plumbing and pumps for energy recovery, renovation of automatic temperature control systems, thermal insulation, relamping and energy recapture. The level of funding to date has set back the Program's planned schedule.

Nature of Change: The requested increase of \$88,000 will partially offset the effect inflation has had on the rate of implementation which can be achieved in energy retrofit. The construction phase will be implemented as rapidly as possible within present funding constraints.





## STATUS OF PROGRAM

Agricultural Research Service (ARS) is concerned with mission-oriented research to ensure an abundance of high-quality, nutritious, reasonably priced food and other agricultural products to meet domestic and world needs while maintaining environmental quality. ARS uses coordinated, interdisciplinary approaches to conduct basic, applied, and developmental research in the fields of livestock, plants, soil-water-air resources, environmental quality, energy, processing, storage and distribution efficiency, food safety and quality, nutrition, consumer service, and agriculturally related health hazards.

Research is conducted at more than 150 locations in the United States, Puerto Rico, Virgin Islands, and several foreign countries. Much of the research is conducted in cooperation with the State agricultural experiment stations, other State and Federal agencies, and private institutions.

## RESEARCH ON ANIMAL PRODUCTION

Current activities: The demand for meat and animal products for human consumption continues to increase in the United States and the demand for animals and animal products from the United States also continues to increase throughout the world. New technology is needed to enable livestock producers to increase production and thus to assure a reliable and safe supply of animal protein while at the same time conserving resources and reducing production costs. ARS research is conducted to improve the efficiency of producing healthy animals and safe, high-quality animal products by improving the genetic and reproductive capacity of animals; improving feeding and management practices; increasing the use of feed sources not suitable for humans; improving the design and use of equipment; and developing more efficient uses of energy. Additional research is conducted to diagnose, prevent, and control diseases caused by infectious microbes, parasites, insects, and other pests and by toxicants. Ways to reduce the cost of rural housing construction and operation; improve water and waste systems; and reduce problems caused by insects that affect man are also being studied.

Research programs on the diagnosis and control of foreign and vector-borne diseases and parasites such as foot-and-mouth disease, African swine fever, Rift Valley fever, and screwworms are unique and of great importance to the livestock industry.

Other research emphasizes basic approaches to help meet long-term objectives such as control of pseudorabies, bluetongue, scabies, and ticks; improvement of reproduction through integrated study of pathology, toxicology, physiology, nutrition and management; conservation of energy on livestock farms; and increasing lean meat disposition through understanding and manipulating the cellular processes of protein and fat synthesis and deposition.

### Selected examples of recent progress:

Genetically engineered vaccine for foot-and-mouth disease. A safer and more effective vaccine for foot-and-mouth disease (FMD) has been made possible by breakthrough research in genetic engineering. The part of the FMD virus coat that will protect cattle from infection has been produced through recombinant DNA technology. Vaccines that will result from this technology will help the United States stockpile vaccine and will mean annual savings of billions of dollars in countries that have the disease. It will also reduce barriers to international trade and will increase the world's supply of meat.

Survey on incidence of pseudorabies in market hogs. Swine were examined to determine the percentage of pseudorabies virus antibody. Sera from 1246 butcher swine were tested for antibody to pseudorabies virus by the

microimmunodiffusion test and the virus neutralization test. Followup contact with veterinarians associated with farms from which the positive sera originated revealed that few feeder swine were vaccinated against pseudorabies, and that most infections with pseudorabies virus were subclinical.

Work on inserting new viral genes into the genome of chickens has begun. Several approaches will be taken to determine how new genes can be introduced into the chicken germline. Scientists will determine if chickens show evidence of spontaneously introduced viral genes by studying the DNA, then attempt to introduce avian tumor virus genes into the chicken germline by infecting susceptible embryos with virus at very early stages of development. They will also attempt to introduce functional virus DNA into the germline. These efforts, if successful, will provide a model system for gene insertion studies, i.e., for resistance, performance, conformation, behavior, etc.

Single treatment with a new drug as a pill or injection kills pests of cattle for several months. An experimental drug, Ivermectin, is made into a special type of large pill (a bolus) that is given by mouth to cattle. The pill stays in the stomach of an animal and slowly dissolves, releasing some of the drug into the manure of the animal, where it kills maggots of the horn fly, a serious pest of cattle. Some of the drug gets into the blood stream of the animal, where it kills ticks that suck blood from the animal. This drug also has been made into a special implant that, when injected into the ear of cattle, also kills ticks and maggots. As single treatment of cattle with this drug in either of these forms can kill ticks and maggots for several months.

Selective use of vitamin D demonstrated in domestic animals. Contrary to current belief, domestic animals discriminate between the two forms of vitamin D. Many animal species preferentially use the animal form (vitamin D<sub>3</sub>) better than the plant form (vitamin D<sub>2</sub>). For example, in cattle only 7-10% as much active metabolite is produced from vitamin D<sub>2</sub> as is produced from vitamin D<sub>3</sub>. Similarly, swine also discriminate in favor of vitamin D<sub>3</sub>. Since current supplementation recommendations are based on the premise that the two forms are equally active, current practices can lead to deficiencies when vitamin D<sub>2</sub> is substituted for vitamin D<sub>3</sub> or toxicity when D<sub>3</sub> is substituted for vitamin D<sub>2</sub>.

Lower milk quality and quantity in dairy cows experimentally infected with a commonly occurring "harmless" parasite. A protozoan parasite (Sarcocystis) that is found in over 75% of the cattle in the United States and until recently was regarded as harmless was fed to experimental dairy cows. Infected cows produced less milk than uninfected control cows, and butterfat, protein, and total solids were also reduced. The widespread occurrence of this parasite indicates that it may have a very significant deleterious effect on milk production that has not yet been properly diagnosed under field conditions.

A new test to diagnose caseous lymphadenitis in sheep. Caseous lymphadenitis abscesses caused by the bacteria *Corynebacterium ovis* are one of the most important worldwide diseases of sheep and goats. An antibody test was developed that indicates present or past infection. The test which utilizes an enzyme as an indicator, is simple, economic, fast, and non-hazardous.

Improved technology for the diagnosis of bluetongue. The radioimmunoassay (RIA) procedure for measuring antibody quantities in sheep and cattle was perfected and is presently being compared to other serologic tests for antibody determination. The RIA procedure is most valuable in support of efforts to apply monoclonal antibody technology to the diagnosis of bluetongue in persistently infected cattle. The application of these procedures will re-open European markets for United States cattle.



A new method for biological control of mosquitoes. A new method for biological control of mosquitoes is now available for use. A new strain of the bacterium, first discovered and isolated in Israel, is highly effective in killing mosquito larvae and is safe when applied to water in which the larvae grow. USDA scientists, researchers in industry and other countries helped in the development and standardization of this biological control agent and the demonstration of its effectiveness and safety. The new agent was registered in 1981.

## RESEARCH ON PLANT PRODUCTION

Current Activities: Research is under way to increase crop productivity so that effective and efficient food production and agricultural systems can help reduce inflationary pressures on consumers and producers and strengthen the Nation's export capacity. Special emphasis in FY 1983 will be given to the following efforts: Support the National Plant Germplasm program; develop integrated weed and brush management systems to improve the productivity of rangelands; integrate pest control methods to manage pests of soybeans and other crops; remove barriers to crop productivity of three major export crops--soybeans, corn, and wheat; develop domestic natural rubber from guayule; increase productivity by breeding varieties that yield under environmental and biological stresses; and improve practices of pest control, culture, and management to reduce energy costs.

Additional and continuing emphasis in FY 1983 will be given to basic research on crop production and protection. This will include research on basic anatomy, physiochemistry, and the physiological functions of plant cells in support of photosynthesis and nitrogen fixation; bioregulation of weed seed germination; bioregulation of mating activity in the bollworm and tobacco budworm; chemistry of host-plant resistance to many pests in several crops; cryogenic storage of plant tissues; and biochemistry, chemical residue, and chemistry of plant constituents.

### Selected examples of recent progress:

Potent viral formulation for control of gypsy moth. Research by ARS scientists contributed to low-cost production of the virus to control the gypsy moth. Even though this virus was registered by the Environmental Protection Agency it has not come into operational use because the formulation does not preserve potency in the field. ARS scientists have developed a new formulation that is roughly 10 times as potent as the previous formulation and is protected from the sun's ultraviolet rays.

Sex pheromone produced by the corn earworm increase parasitism of this pest by its natural enemies. The parasite of earworm eggs, the wasp *Trichogramma*, is attracted by the pheromone. In a series of field tests, this wasp attacked more than twice the normal number of eggs when the pheromone was artificially distributed throughout the field. This use of the pheromone should be effective for integrated pest management programs.

Wild relative of corn is resistant to the most severe viral disease of corn. A few backcross plants from (corn X *Zea diploperennis*) X corn were resistant to maize chlorotic dwarf virus (MCDV). This wild relative is resistant to MCDV, the most severe, widely distributed viral disease of corn. Yield losses have been as high as 70%. Resistance has not previously been found in corn, although differing levels of tolerance do exist. The transfer of resistance from a wild relative of corn to corn germplasm gives promise that eventually resistance to this devastating virus, which occurs in the Southern Corn Belt and throughout the southern corn-growing states, will be fully incorporated into commercial corn varieties.

Biocontrol of Take-all, a soilborne disease of wheat. Significant biological control of take-all in field plots was documented for the second

consecutive year through use of antibiotic-producing, root-colonizing, fluorescent pseudomonad bacteria applied on the seed. Larger scale testing and even pilot testing is planned. The bacterium is a natural inhabitant of wheat roots and apparently gives effective natural control of Take-all after many years of wheat monoculture.

New tool to fight bagworms is discovered. A 3-year intensive research effort by ARS scientists at Beltsville has resulted in the identification and synthetic production of a compound that is highly attractive to male bagworm moths. This important discovery may allow homeowners and nurserymen either to trap males in massive numbers or to disrupt the reproductive behavior of the insects. Bagworms, which are destructive pests of evergreens and many other plants, cost the public millions of dollars annually in costs of direct control and of replacement of plants killed or severely damaged by repeated attacks.

New range plants from People's Republic of China. A U.S. Germplasm Delegation spent a month in China during July and August 1980 and returned with 200 forage collections plus cereals and vegetables. This delegation traveled to parts of China not visited by previous teams. These new range plants may find use in the northern Great Plains and Intermountain Region of the United States. This germplasm has been placed in the international germplasm system, and it will soon be made available to plant breeders.

Sex pheromones of corn rootworms and the lesser cornstalk borer identified and synthesized. These pheromones are highly effective in attracting the males of these pests under field conditions. Pheromone traps allow the pest populations to be determined accurately so that insecticides may be applied most effectively and crop losses can be reduced. These discoveries will aid integrated pest management systems of both corn and peanuts.

Soybean germplasm developed. Two soybean introductions from Korea were found to be resistant to all seven known strains of soybean mosaic virus. This disease is widely distributed in the world and can cause severe losses. Also, the first improved germplasm adapted to the Midwest with resistance to both races 3 and 4 of the soybean cyst nematode was released to soybean breeders.

Intergeneric citrus hybrids prove to be extremely cold tolerant. Hybrids between citrus and distant relatives from Australia and China - Eremocitrus and Poncirus - have proven to be extremely cold tolerant. In the  $-15^{\circ}\text{C}$  freeze of January 1981 in Central Florida, these hybrids exhibited little or no damage, whereas trees of commercial varieties were killed. This genetic breakthrough may eventually lead to the commercial production of citrus in more temperate climates.

North Carolina boll weevil program increases beneficial insects and reduces insecticide use. In areas of North Carolina where the boll weevil problem has been eliminated by the boll weevil eradication trial, beneficial insect populations have increased substantially and the number of insecticide applications has declined between 60 and 80 percent. In Chowan County, where boll weevils have not been detected since June, 1978, insecticide need not be applied every season, thus significantly reducing the cost of cotton production in these areas.



Nectariless cottons reduce need for chemical pesticide application. Cotton breeders have selected cottons which lack the extra-floral nectaries of normal varieties and do not secrete nectar, which attracts damaging insects. In a 3-year comparison with standard varieties in the Mississippi Delta, nectariless types attracted 45% fewer *Lygus* bug nymphs and 26% fewer adults. This reduces the amount and number of applications of chemical pesticides needed to control this insect and also permits buildup of beneficial predators which help control the bollworm. In 1981, a commercial nectariless variety based on germplasm developed and released by ARS and the Mississippi Agricultural and Forestry Experiment Station, was planted on 11% of the U.S. acreage.

Two short-statured Pima lines released for use in high-yielding hybrid cotton. Experimental hybrids produced by crossing upland cotton with extra long-staple American Pima lines are superior in yield and fiber quality to current upland varieties. Excessive vegetative growth of these hybrids, however, results in lodging and harvesting problems. The release of Pima 79-103 and Pima 79-106 provided two early-maturing, short-statured parental lines that have shown superior yield, improved insect resistance, and optimum plant height and maturity in hybrid cotton tests across the Cotton Belt. Although these hybrid cottons are still in the experimental stage, they appear very promising as a means to increase cotton yields by 10 to 20 percent.

High precision sprayers eliminate variations in pesticide application rates. Research engineers have developed several new designs of sprayers which greatly increase the precision and control of pesticide usage. These sprayers meter pesticide concentrate into the water diluent immediately ahead of the spray nozzles at a rate proportional to travel speed, eliminating tank mix of pesticides and eliminating variation of application rate caused by variations in speed. The sprayer built for orchard use also completely surrounds the tree, to eliminate blow-through of spray.

Use of Gamma radiation to control insect pests on new agricultural commodities. A petition to establish an exemption from the requirement of a tolerance for the use of gamma radiation to control insect pests on raw agricultural commodities after harvest was developed in the Minor Use Pesticides Program by ARS and submitted to the Food and Drug Administration through the IR-4 program. This technology will reduce the dependence on the chemical fumigants now in use. The exemption will provide for commercial, and legal use of a nonchemical method of controlling insect pests. Several foreign countries now utilize this method for insect control.

New type mild flavored storage onion developed. Fast-food merchandising and salad bars have greatly increased demand for mild flavored onions. Unfortunately, such types do not store well and are not adapted to northern producing areas. A major breakthrough has been achieved by ARS scientists in producing a new nonpungent, high-yielding hybrid with good storage quality. Wide-scale testing throughout the north central and northeastern areas is generating enthusiastic response. Seed production is progressing to meet demand for early release and distribution. This new type of onion is expected to have a marked impact on production and marketing in northern producing areas, and export potential may be significant.

Nematicides applied through a sprinkler irrigation system effectively controlled nematodes. Two chemicals registered to control nematodes were applied to field corn and squash by injection into a sprinkler irrigation system. This technique was compared with a conventional application of the nematicide granules spread on the soil surface and incorporated into the top 8 inches of soil. Both applications equally and effectively controlled nematodes with corresponding yield increases of 54% for corn and 196% for squash. This new technique should reduce the cost of nematicide application by 40% compared with conventional methods and reduce hazard to humans by use of a closed pesticide application system.

Dry red pepper harvester developed. Research engineers have developed and tested a machine which satisfactorily harvests dry red peppers. The machine rakes the peppers from the plants with soft plastic fingers which protrude from belts surrounding the row, and peppers which have fallen to the ground are also picked up. Hand-harvesting of red peppers is usually arduous and irritating work, and possibly for this reason, about half of chili pepper products, such as paprika powder, are presently imported. The simple harvesting machine developed should permit more chili peppers to be grown and marketed in the U.S.

## RESEARCH ON THE USE AND IMPROVEMENT OF SOIL, WATER AND AIR

Current Activities: Research is conducted to develop technology for using and conserving soil, water, and air resources while sustaining optimum agricultural productivity. Much of this research deals with developing management systems and strategies that optimize the production of food and fiber, minimize the adverse effects of agricultural systems on the environment, and assure the efficient use of our soil, water, and air resources for future generations. Investigations include those aimed at reducing salt damage to soils, crops, and water; improving irrigation and drainage of agricultural lands; developing tillage practices for reducing soil erosion, and for improving soil properties and crop growth; managing and using precipitation and solar energy for crop production; reclaiming and revegetating land areas disturbed by man; utilizing, managing, and conserving soil fertility for increased production and nutritional quality of plants and animals; preventing pollution of and improving the quality of soil, water, and air; controlling erosion by water and wind, and sedimentation; and conserving and managing agricultural water resources. Much of these investigations deal with developing an understanding of the basic physical, chemical, and biological processes involved so that the effects of agricultural systems can be accurately interpreted, and models of these systems, which have regional and national application as planning and management tools, can be developed.

Soil, water, and air research affects many problems relating to both agricultural and nonagricultural needs. Major thrusts of this research include studies on nonpoint source pollution; using crop residues for erosion control; effects of tillage and nitrogen efficiencies on crop production; application of remote sensing technology to provide agricultural information; and improved efficiency of irrigation and management of water resources. Additional emphasis is being placed on evaluating the effect of erosion on soil productivity; understanding the mechanisms involved in nonpoint source pollution and predicting the effect of various management practices on water quality; and the use of remote sensing technology in agriculture. The major emphasis of the research is to expedite the development of farm management systems that provide the farmer and the land use planners with improved information for decisions.

### Selected examples of recent progress:

Hand-held instrument developed for measuring soil salinity. A hand-held electromagnetic device has been developed for determining the degree of soil salinity without requiring laboratory analyses of soil samples. Also, from the readings obtained as the instrument is held at various heights above the soil surface, the soil salinity profile can be mapped in the field. The method is convenient, fast, and reasonably accurate. It has excellent potential for monitoring soil salinity changes and identifying saline seep areas.

New low cost automatic furrow irrigation system. A totally new concept has been developed for transporting and distributing water to irrigation furrows. This system is unique in that it uses a single pipeline -- a common plastic irrigation pipe -- and enables low cost automatic control of



water to individual furrows -- via a moving plug controlled by a battery-powered motor. A computer model of the system enables one to rapidly determine optimum pipe and orifice sizes. When used with a water reuse system, very high water application efficiencies and uniformities can be expected.

Soybean resistance to water movement limits yield. One factor prompting the genetic improvement of soybean yield is the plant water status at midday. Photosynthesis and other processes with similar sensitivity to low water potentials could be depressed at midday. Laboratory measurements of water transport properties of soybeans showed that the site of resistance to flow which causes the midday water deficits is within the plant rather than the soil, regardless of the water status of the soil-plant system. This finding indicates that modification of the plant to eliminate midday water deficits could significantly improve yield in soybeans.

Crop field temperatures observed by satellite strongly affected by the availability of water for evapotranspiration. The temperature of sorghum, citrus, and sugarcane fields was related to three different measures of water availability: amount depleted since the last rain or irrigation, days since rainfall or irrigation, and ratio of actual evapotranspiration to potential evapotranspiration the day of the satellite temperature observation. This research is one of the first to demonstrate a relationship between quantitative evapotranspiration measurements and satellite-observed surface temperature, and implies that the thermal data will complement other methods of identifying and monitoring droughts and their effects on crop and rangeland productivity during the growing season.

Winter wheat heading controlled at low latitudes by daylengths. Low winter wheat production at latitudes below about 30°N results from insufficient cold to vernalize the plants. However, growth of winter wheat for two seasons at Weslaco, TX, (26°N latitude) demonstrated that ample chilling was received for vernalization. On the other hand, the plants of important Great Plains winter wheat cultivars would not change from vegetative to reproductive growth until about March 1, when days became at least 12 hours long. Consequently, heading was delayed until about April 20. By then, air temperature was high, the plants senesced rapidly, and shriveled kernels were produced. These results suggest that incorporating genes that reduce the photosensitivity by about 45 minutes could extend the winter wheat belt as much as 300 kilometers further south.

Reclaimed western stripmined lands can be used for livestock grazing. Dry matter forage production and animal performance were equal on mined and unmined land in North Dakota, when grazed at the same intensity and used as spring-early summer pastures. The reclaimed pastures were seeded to introduced grass species, whereas the unmined pastures were native range in good to excellent conditions. Forage samples from reclaimed and undisturbed sites at three mines, located in Montana and Wyoming, were compared for forage quality and for possible accumulation of heavy metals by those forage species growing on reclaimed mined lands. Forage on the reclaimed sites was somewhat lower in nutritional quality than forage collected from contiguous undisturbed areas; however, there was no evidence of heavy metals in the forage from reclaimed lands and thus little evidence to warrant the fear of heavy metals entering the food chain through this source. This information would help regulatory agencies, mine companies, and the public in their planning and assessment of reclamation.

Nationwide program developed on nitrogen and tillage research. Proper management of nitrogen fertilizer and crop residues by good tillage practices not only helps control soil erosion but also contributes to optimum cycling of plant nutrients. Therefore, a nationwide effort has been developed for improved methods of soil management to increase efficiency of fertilizer and fuel usage, and to control soil erosion and environmental degradation. Simulation modeling of nitrogen, tillage, and

residue management is being used along with field experiments at the various research locations. Isotopically labeled nitrogen fertilizer research shows that conservation tillage and proper residue management result in increased reserves of soil nitrogen and increased organic matter in the surface soil layers.

A guide for predicting sheet and rill erosion on forest land. Forest management practices vary substantially in their effect on productivity and erosion. Effective management of forest soils requires that erosion be minimized. This, in turn, requires a knowledge of the factors that control soil losses. Working cooperatively with the U.S. Forest Service, ARS scientists have successfully adapted the Universal Soil Loss Equation for use on forest lands. Major factors in the forest environment that must be considered include: ground cover such as litter, slash, logs, and surface rock; forest canopy; soil reconsolidation, high organic matter content, a dense mat of fine roots in the surface layer; and high aggregate stability. By modifying the cover-management factor in the Universal Soil Loss Equation to accommodate these unique characteristics of the forest environment, a procedure for estimating sheet and rill erosion in forests has been developed and published.

Impact of Mt. St. Helens eruption on land management assessed. The eruption of Mt. St. Helens deposited a layer of volcanic ash up to 5 cm deep over a significant portion of the farmland in eastern Washington. An intensive field study was conducted in cooperation with the University of Idaho and the Soil Conservation Service to provide tillage and management recommendations to farmers before fall tillage and to assess potential flooding hazards from winter precipitation. The results showed that the ash layer had an infiltration capacity of about 1 cm/hr, which is adequate for most of the low-intensity precipitation in the area, and that normal conservation tillage would prevent any adverse effects. These results and recommendations were used extensively by farmers and State and Federal technical specialists.

#### RESEARCH ON PROCESSING, STORAGE, AND DISTRIBUTION, FOOD SAFETY AND CONSUMER SERVICES

Current activities: The current Post Harvest Science and Technology program is targeted to improve the quality of agricultural products and to ensure their safety and low cost through expansion of the information and knowledge base needed to stimulate innovative development in marketing, transportation, processing, storage, and consumer services. Primary goals of the research are to reduce product and commodity losses, increase exports, improve productivity, optimize quality and nutritive value, ensure consumer and worker safety, conserve energy, protect the environment, and enhance the quality of life.

In pursuit of these goals, the program in FY 1983 will emphasize both basic research and research in response to the stated needs of action agencies. The basic research includes investigations to provide more complete understanding of the fundamental biological processes in agricultural products and commodities that are the key to improving food quality and safety and to reducing losses. Uncovering the factors that cause growth of aflatoxigenic fungi in the field, for example, would provide the basis for a program on the prevention or control of such contamination in food and feed commodities. Emphasis will be directed to the development of (1) quarantine treatments to destroy pests in fruits and vegetables such as the Mediterranean fruit fly; (2) alternatives to nitrite (such as substitute chemicals and food irradiation) in food processing; (3) more rapid instrumental and chemical techniques to monitor toxic and drug residues in meat and poultry; (4) technologies to ensure the safety of grain inspectors and grain elevator workers. Additional effort will be targeted to supporting export commodity programs; developing innovative pest management systems that will



reduce losses during storage, handling, and domestic or export distribution; developing food processing methods to reduce the sodium content, now considered a risk factor in hypertension; and identifying and eliminating the causative factors of byssinosis, a health concern in cotton textile mills. Resources will also be applied to developing more effective methods for conversion of biomass to gaseous and liquid fuels, with special attention to on-farm pretreatments and processing; determining the factors affecting the quality stability of soybeans, cottonseed, and peanuts; developing rapid, automated nondestructive instrumentation to measure product quality; and identifying the cause of and developing methods to control texture and flavor changes in meat after processing.

Selected examples of recent progress:

Quarantine treatments recommended for 10 host commodities of the Mediterranean fruit fly. Fumigation treatment protocol required by the Animal and Plant Health Inspection Service to permit shipment of the host commodities from infested areas has been developed. The commodities for which treatment schedules have been developed are: avocados, bell peppers, cantaloupes, cucumbers, nectarines, navel and Valencia oranges, peaches, pears, strawberries, and tangerines. California farmers received a total of \$943 million for these 10 crops in 1979.

Odor detectors in potato bins prevent losses in long-term storage. An electronic sniffer for monitoring the "breathing" of stored potatoes detects abnormalities that result from bacterial infections and rot. Abnormal amounts of certain volatile chemicals are early warning signals of bacterial soft rot. These can be readily detected by the odor detector. A system for continuous monitoring has been designed and demonstrated on commercial-size bins that contained more than 1 million pounds of potatoes each. Early warning will give growers needed time to take remedial action to avoid losses. The benefit of early soft-rot detection is expected to reduce, by at least 20 percent, the 400- to 700-million-pound loss currently suffered by growers. Other benefits expected are more efficient bin ventilation and higher potato quality.

Chemical method that predicts nutritional availability of food iron. Iron deficiency is the most common nutrient deficiency in the United States and the world. A major limitation in addressing this problem has been the inability to assess, with reasonable predictability, the availability of iron in foods by methods other than expensive human studies. The first chemical method that shows good correlation with human studies has been developed by ARS scientists at the U.S. Plant, Soil, and Nutrition Laboratory, Ithaca, NY in collaboration with Cornell University. The effects of factors known to enhance iron absorption (ascorbic acid, orange juice, meat) or to inhibit iron absorption (tea, whole wheat bread, processed cheese, eggs) in human subjects were of the same magnitude as the effects indicated by the in vitro chemical method. The results obtained by this procedure also correlated well with those obtained in human studies aimed at testing the availability of iron-fortification compounds commonly used to fortify flour, bread, and other cereal grain products.

Improved methods for removing aflatoxin-contaminated peanuts. Aflatoxin, a toxic product of fungi, and foreign material are the major problems affecting both domestic and export peanut markets. Removal of aflatoxin-contaminated peanuts costs the industry and consumers several million dollars each year. Studies equipment layout and process flow in precleaning

and shelling operations show that shelling plants can be designed to segregate most of the contaminated kernels into "specific process streams" thereby providing more effective removal. These procedures also enhance removal of foreign material. These studies are the outgrowth of a cooperative effort between ARS and the peanut industry.

Alternative fumigation treatment for exported fresh strawberries.

Fumigation with ethyl formate, a compound that occurs naturally in plants, was proved to be effective for the control of western flower thrips on fresh strawberries. All live insects on strawberries must be killed to meet Japanese quarantine requirements and, thus, to permit the export of U.S.-grown strawberries to Japan. The strawberries were not injured by this treatment. Alternatives to conventional methyl bromide fumigation are needed because of regulations, in many countries, that restrict the amount of bromide residues allowed.

New cotton lint system will decrease electric energy usage and particulate emissions and better preserve fiber properties. Half of the electric energy used in a gin is for operation of air fans for pneumatically transporting cotton lint being processed. The pneumatic transport system contains half the particulates that must be collected from gin exhausts. The feasibility of transporting lint from the gin stand to the bale press and of cleaning it simultaneously has been demonstrated. Mechanical transport eliminates the energy requirement for pneumatic transport and greatly reduces the particulate collection problem since large volumes of air (currently as much as 150,000 cfm) do not have to be cleaned. Tests also indicate that average cotton-fiber length when lint is transported mechanically is at least 0.08 inch longer than when it is transported pneumatically. The new system should provide an increase in the value of grade 31 Acala lint by \$2.85 per 100 pounds or \$13.68 per 480-pound bale.

Plastics and plants. Basic research on the concept of using renewable natural polymers to replace petroleum-derived materials has resulted in new, biodegradable plastics. The potential is excellent for applying the technology to development of biodegradable mulch, planters, and containers urgently needed by farmers. The new material is made from the natural polymer, starch, by expanding its molecules with water, heat, and ammonia and then suddenly reducing the temperature in the presence of other polymers that are compatible. The result is a composite of natural and synthetic material that is strong, flexible, and biodegradable. About 30 billion pounds of plastics now are produced annually; replacement of some of these materials with plant-derived plastics can decrease our dependence on finite petroleum and alleviate the negative impact on the environment caused by discarded film and containers made from petrochemicals.

Process innovation for goats' milk helps small producers sell year-round.

The availability of fresh goats' milk fluctuates seasonally. A process has been developed for freezing the milk as a concentrate and, thereby, preserving it for almost 1 year. Changes in physical stability during storage are minimal, and the taste quality of the reconstituted milk is close to that of the fresh product. Commercial use of this process could ensure a year-round supply of goats' milk for consumers.

Chicken preserved by new food preservation method requires no

refrigeration. Process technology and food safety studies have been completed to establish the safety and acceptability of radiation-sterilized, shelf-stable chicken. The evidence indicates that the product is completely safe for human consumption. If the process is approved by the Food and Drug Administration, industry will have the means of producing an entirely new line of shelf-stable foods.

New electronic data-acquisition system developed for the study of shipping fever in cattle. A new, self-contained, solid-state electronic system has a memory, similar to that in calculators and microcomputers, to record vital signs of unrestrained cattle. The system has several advantages over radio-telemetry system: It has no radio-frequency interference, any number of animals can be monitored simultaneously, it has unlimited distance, and it will process the data (i.e., data averaging) directly on the animal.

Conversion of biomass to ethanol. Hemicellulose in plant residues is one of the major components of renewable biomass, comprising up to 35 percent of plant materials. Hemicellulose, when subjected to a simple, low-cost acid hydrolysis, yields a mixture of sugars with D-xylose (a 5-carbon sugar) as the major product. Before D-xylose can be used, however, and thereby provide for full utilization of hemicellulosic residues for the production of fuel and petroleum-sparing compounds, a new fermentation process is required. A yeast with the unique capability of efficiently converting D-xylose to ethanol was discovered in the ARS Culture Collection. The discovery promises a way to produce more alcohol from biomass than has previously been possible with the techniques and equipment commonly available in the fermentation industry.

Defined growth medium developed to enhance study of a food-poisoning anaerobic bacteria. Food poisoning caused by bacterial toxins is a continuing public concern. A defined growth medium has been developed that will allow the toxin-forming anaerobic bacterium, Clostridium perfringens to divide into small spores. Use of this medium allows detailed study of the growth processes and requirements essential for toxin formation of the bacterium and, thereby, can lead to improved microbiological control and prevention of food poisoning.

## RESEARCH ON HUMAN NUTRITION

Current activities: The major USDA program in human nutrition research is within ARS. For best use of all available expertise with the limited resources available, it is necessary to carefully coordinate the work of several groups within the Department. Research and evaluation projects exist in ES, FNS, HNIS and CSRS. Nutrition information and education projects exist in FNS, HNIS, FSIS, ES, and OGPA.

Nutrient needs vary according to age, sex, physical activity, and health status. By use of both human subjects and animal models, investigators are determining the ranges in levels of nutrients needed by humans. Emphasis is placed on the special needs of infants and young children and the elderly.

Studies are being conducted on nutrient content of foods, biological processes that influence availability, and interactions among nutrients and other dietary components, such as fiber. New and increasingly sophisticated techniques and instrumentation also are being developed as an integral part of these studies.

Knowledge gained about people's nutritional needs at various stages in life, their food consumption patterns, and the nutritive value of the food they eat, is applied in many ways from establishing standards for Government food and nutrition programs, to developing guidelines that help people know what foods to eat for a healthful diet.



Selected examples of recent progress:

Breast milk alone, provides less than the recommended daily allowance for vitamin B<sub>6</sub> to the infant. In a study involving lactating women, infants of mothers supplemented with as much as 4 mg vitamin B<sub>6</sub> per day, received less than the Recommended Dietary Allowance of vitamin B<sub>6</sub> during the first 6 months of life. Based on these findings the Recommended Dietary Allowance for vitamin B<sub>6</sub> in infants should be re-examined.

Nutrient composition of ready-to-eat foods. Reports of extensive studies of nutrient composition of "fast foods" and of breakfast cereals and granolas were published. This is the most extensive research listing of the nutrient components of ready-to-eat foods ever published.

Weight control program for obese children. The effect of moderately restricted diets and light exercise routines on the weight control of young obese boys was studied. The results indicate that a decreased intake of 600 k cal per day (mainly sugar and/or high-fat snack foods) and light physical exercise were sufficient to stop weight gain and to normalize key metabolic parameters usually associated with atherosclerosis, hypertension and diabetes. These studies suggest a practical approach for improvement in the health outlook of obese children.

Soybean protein and availability of iron. When human subjects consumed high levels of a soybean isolate they had markedly lower retention of dietary iron than when they consumed equivalent levels of animal protein. These results preceded a report that iron absorption in human subjects was strongly depressed by soy products. This effect is of major importance because of the wide use of soy products in food supplements eaten in the USA and abroad. The results have stimulated the planning of extensive human studies to assess the practical importance of the iron status of people under field conditions.

Post-partum breast-feeding educational support. Human milk has been identified as the ideal nutrient source for infants. There appears to be, however, a marked non-random distribution of infant feeding in the United States. Women from middle- and upper-income groups are much more likely to breast-feed their infants than are their low-income counterparts. In addition, data demonstrate that among low-income women who choose to breast-feed, there is marked discontinuation of breast-feeding during the first month. Preliminary evidence indicates that prenatal, in-hospital, and post-partum breast-feeding support services can improve significantly the success rate of breast-feeding among low-income women during the first month post-partum.

Protein requirements for older Americans. A study of nitrogen balance in elderly men and women, over a period of 30 days, revealed that the current Recommended Daily Allowance for protein is not adequate for a majority of men and women 70 years or older. This finding may have significance for the preservation of muscle mass during aging.

Body iron stores and neuropsychological functions. Neuropsychological function of normal humans was related to body iron stores. A cross sectional study revealed that characteristics of the electroencephalogram were highly associated with plasma ferritin levels. Thus it appears that nutrient iron has profound effects on neuropsychological function. These findings are especially significant for persons with mild iron depletion without anemia. This condition is relatively common in the United States.



CONTINGENCY RESEARCH FUNDS

The Contingency Research Fund, established by Congress in fiscal year 1962, is designed to provide a ready source of funds to meet unforeseen and immediate research needs. Releases from the fund are generally made in situations where an emergency exists, or for special needs such as an unexpected scientific "breakthrough," or for new diseases or pest problems where it appears inadvisable to wait for consideration of a request for funds for the project in the regular budget process. In allocating funds, the procedure is to make no commitments for allocations from the fund beyond the current year.

<u>Animal Production Efficiency Research:</u>	<u>1981 Obligations</u>
Construction of Screwworm facility, Fargo, North Dakota.....	\$ 253,040
Research on epidemiology of Trichinosis in swine.....	125,000
Partial funding of research on Southern Cattle and Tropical Bout Tick.....	7,660
<u>Crop Production Efficiency Research</u>	
Research on the effect of temperature on efficacy and phytotoxicity on methyl dibromide on fresh commodities in fruit fly quarantine treatments.....	50,000
Rearing of Mediterranean Fruit Fly.....	85,000
Research in response to the first discovery of the corn cyst nematode, <u>Hoterodera zaeae</u> , in the U.S. ....	110,000
Research on Verticillium Wilt of alfalfa.....	39,300
Research to develop methods for control of the perennial weed, Leafy Spurge, on rangelands.....	200,000
<u>Processing, Storage, Distribution Efficiency Research</u>	
Research to destroy Trichenella Siprolis in pork chops.....	30,000
Research on insect resistant packaging on the Department of Defense Meal-Ready-to-Eat Portion (MRE).....	<u>100,000</u>
Total, 1981 obligations, Contingency Research Fund.....	<u><u>1,000,000</u></u>

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

(On basis of adjusted appropriation)

Location	Actual 1981		Estimated 1982		Estimated 1983	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
ALABAMA, Auburn.....	2,273,839	53	2,194,600	53	2,434,500	53
ALASKA, Palmer.....	556,215	8	517,400	8	543,100	8
ARIZONA						
Phoenix.....	4,116,367	100	3,988,100	100	4,599,800	100
Tucson.....	3,068,518	77	3,260,200	77	3,718,700	77
Total....	7,184,885	177	7,248,300	177	8,318,500	177
ARKANSAS						
Booneville.....	835,944	6	925,300	6	970,900	6
Stuttgart.....	184,902	2	239,300	2	251,100	2
Total....	1,020,846	8	1,164,600	8	1,222,000	8
CALIFORNIA						
Albany.....	19,057,983	372	18,156,100	371	20,431,700	361
Brawley.....	365,727	10	296,200	10	311,000	10
Davis.....	1,209,147	18	1,613,800	18	1,692,800	18
Fresno.....	2,585,203	65	2,666,200	65	2,925,900	65
Indio.....	244,747	9	235,000	9	246,700	9
Pasadena.....	1,015,163	19	1,020,500	19	1,134,600	19
Riverside.....	2,299,650	57	2,512,900	57	2,979,500	57
Salinas.....	1,559,524	33	1,309,600	33	1,374,600	33
San Francisco.....	1,850,461	10	1,844,900	10	2,824,200	10
Shafter.....	1,428,191	21	1,022,400	21	1,073,200	21
Total....	31,615,796	614	30,677,600	613	34,994,200	603
COLORADO						
Akron.....	516,507	8	436,800	8	544,900	8
Denver.....	1,610,763	38	1,974,600	38	2,070,400	38
Fort Collins.....	4,533,556	96	4,637,700	96	5,256,700	96
Total....	6,660,826	142	7,049,100	142	7,872,000	142
DELAWARE						
Georgetown.....	349,290	9	335,100	9	351,900	9
Newark.....	414,996	14	465,400	14	488,800	14
Total....	764,286	23	800,500	23	840,700	23
DISTRICT OF COLUMBIA						
Program.....	2,392,388	77	2,268,600	77	2,593,100	77
Headquarters						
Agency Management Services.....	23,472,766	776	22,327,100	763	23,892,600	753
Centrally Financed Program...	10,774,452	8	12,294,600	8	12,294,600	8
Subtotal....	34,247,218	784	34,621,700	771	36,187,200	761
Total.....	36,639,606	861	36,890,300	848	38,780,300	838

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1981		Estimated 1982		Estimated 1983	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
<b>FLORIDA</b>						
Belle Glade.....	283,939	6	175,100	6	184,000	6
Brooksville.....	278,718	4	196,400	4	206,400	4
Canal Point.....	854,590	22	684,500	22	719,600	22
Fort Lauderdale.....	296,948	5	497,800	5	523,300	5
Gainesville.....	6,891,877	144	6,700,600	144	7,768,700	144
Lake Alfred.....	92,922	2	119,900	2	126,100	2
Miami.....	956,008	24	836,200	24	954,500	24
Orlando.....	2,220,506	61	2,303,600	61	2,550,300	61
Winter Haven.....	792,302	17	739,200	17	776,900	17
Total....	12,667,810	285	12,253,300	285	13,809,800	285
<b>GEORGIA</b>						
Athens.....	7,332,332	205	7,469,700	205	8,483,100	205
Byron.....	1,613,183	46	1,620,900	46	1,863,700	46
Dawson.....	924,954	23	923,900	23	968,300	23
Experiment.....	280,852	6	231,800	6	329,400	6
Savannah.....	2,210,689	60	2,063,700	60	2,164,900	60
Tifton.....	5,469,766	121	5,707,100	121	6,172,300	121
Watkinsville.....	1,225,546	33	1,115,600	33	1,342,900	33
Total....	19,057,322	494	19,132,700	494	21,324,600	494
HAWAII, Honolulu.....	1,782,466	40	1,840,400	40	1,922,100	40
<b>IDAHO</b>						
Aberdeen.....	352,538	7	370,800	7	518,100	7
Boise.....	764,640	16	775,000	16	986,100	16
Dubois.....	1,534,454	16	1,194,600	16	1,253,600	16
Kimberly (Twin Falls).....	1,759,724	48	1,929,500	48	2,285,100	48
Total....	4,411,356	87	4,269,900	87	5,042,900	87
<b>ILLINOIS</b>						
Chicago.....	127,268	3	148,400	3	155,700	3
Peoria.....	18,078,327	325	19,252,900	325	22,017,000	315
Urbana.....	2,827,736	45	2,512,000	45	2,867,100	45
Total....	21,033,331	373	21,913,300	373	25,039,800	363
<b>INDIANA</b>						
Lafayette.....	2,184,120	32	2,313,200	32	2,685,000	32
Vincennes.....	350,119	7	294,400	7	307,800	7
Total....	2,534,239	39	2,607,600	39	2,992,800	39

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1981		Estimated 1982		Estimated 1983	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
IOWA						
Ames.....	11,938,267	296	12,749,700	296	14,121,700	296
Ankeny.....	369,818	9	405,800	9	426,600	9
Total.....	12,308,085	305	13,155,500	305	14,548,300	305
KANSAS, Manhattan.....	2,948,109	70	3,095,100	70	3,365,500	70
KENTUCKY, Lexington...	801,397	22	810,900	22	859,800	22
LOUISIANA						
Baton Rouge.....	1,016,329	29	1,220,000	29	1,321,500	29
Crowley.....	69,928	2	--	--	--	--
Houma.....	1,252,650	31	1,208,800	31	1,267,800	31
Jeanerette.....	12,709	--	--	--	--	--
Lake Charles.....	379,562	/	325,100	7	384,000	7
New Orleans.....	20,147,497	397	23,347,900	397	26,031,400	387
Total.....	22,878,675	466	26,101,800	464	29,004,700	454
MAINE, Orono.....	447,029	9	484,800	9	509,000	9
MARYLAND						
Beltsville.....	55,821,534	1,297	62,588,800	1,297	70,652,400	1,287
Frederick.....	1,680,633	34	1,864,800	34	1,956,700	34
Glenn Dale.....	310,650	10	309,900	10	325,700	10
Hyattsville.....	331,888	12	327,000	12	343,600	12
Total.....	58,144,705	1,353	65,090,500	1,353	73,278,400	1,343
MASSACHUSETTS						
Boston.....	3,317,434	2	3,488,200	2	3,696,800	2
Otis AFB.....	156,381	2	223,400	2	236,700	2
Total.....	3,473,815	4	3,711,600	4	3,933,500	4
MICHIGAN, East Lansing	2,733,039	63	2,573,100	63	3,026,500	63
MINNESOTA						
East Grand Forks....	359,064	9	399,900	9	419,500	9
Minneapolis.....	164,457	3	178,900	3	187,600	3
Morris.....	1,214,948	30	1,110,500	30	1,251,100	30
St. Paul.....	1,955,615	38	2,012,600	38	2,335,100	38
Total.....	3,694,084	80	3,701,900	80	4,193,300	80
MISSISSIPPI						
Gulfport.....	221,285	8	239,000	8	250,900	8
Meridian.....	379,877	10	329,100	10	345,500	10
Mississippi State...	4,577,806	102	4,154,700	102	4,530,600	102
Oxford.....	1,921,146	52	2,127,800	52	2,416,400	52
Poplarville.....	253,033	6	253,600	6	266,000	6
Stoneville.....	6,002,902	178	5,583,900	178	6,135,500	178
Total.....	13,356,049	356	12,688,100	356	13,944,900	356



STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1981		Estimated 1982		Estimated 1983	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
MISSOURI, Columbia...	3,652,287	88	3,765,200	88	4,080,700	88
MONTANA						
Bozeman.....	820,504	16	734,200	16	771,100	16
Miles City.....	1,338,746	11	1,082,800	11	1,222,300	11
Sidney.....	783,211	21	836,100	21	878,100	21
Total....	2,942,461	48	2,653,100	48	2,871,500	48
NEBRASKA						
Clay Center.....	6,313,601	56	6,227,400	56	7,353,100	56
Lincoln.....	2,141,445	35	2,130,100	35	2,668,400	35
Total....	8,455,046	91	8,357,500	91	10,021,500	91
NEVADA, Reno.....	625,218	13	571,800	13	707,500	13
NEW JERSEY						
New Brunswick.....	240,197	5	190,500	5	198,600	5
NEW MEXICO						
Las Cruces.....	1,271,647	30	1,015,900	30	1,062,800	30
NEW YORK						
Geneva.....	222,565	5	200,500	5	275,200	5
Ithaca.....	2,643,439	40	2,435,700	40	2,775,100	40
Plum Island.....	11,819,599	322	11,250,100	322	12,510,200	322
Total....	14,685,603	367	13,886,300	367	15,560,500	367
NORTH CAROLINA						
Oxford.....	1,455,995	38	1,381,800	38	1,488,800	38
Raleigh.....	3,293,170	51	3,207,900	51	3,804,000	51
Total....	4,749,165	89	4,589,700	89	5,292,800	89
NORTH DAKOTA						
Fargo.....	6,244,810	124	5,631,500	124	6,236,800	124
Grand Forks.....	3,485,592	32	3,243,500	32	3,412,400	32
Mandan.....	2,084,186	50	1,813,400	50	2,081,600	50
Total....	11,814,588	206	10,688,400	206	11,730,800	206
OHIO						
Columbus.....	157,467	4	187,600	4	197,000	4
Coshocton.....	732,299	14	697,100	14	817,800	14
Delaware.....	439,798	12	576,600	12	603,900	12
Wooster.....	1,303,947	36	1,310,100	36	1,460,800	36
Total....	2,633,511	66	2,771,400	66	3,079,500	66
OKLAHOMA						
Durant.....	1,667,693	46	1,595,700	46	1,675,800	46
El Reno.....	1,265,116	18	1,240,200	18	1,302,600	18
Stillwater.....	1,197,617	22	1,100,800	22	1,216,400	22
Woodward.....	679,249	16	453,000	16	604,800	16
Total....	4,809,675	102	4,389,700	102	4,799,600	102

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1981		Estimated 1982		Estimated 1983	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
OREGON						
Burns.....	169,231	1	209,900	2	220,300	2
Corvallis.....	2,368,006	44	2,345,500	44	2,459,500	44
Pendleton.....	737,913	20	821,900	20	947,400	20
Total.....	3,275,150	65	3,377,300	66	3,627,200	66
PENNSYLVANIA						
University Park.....	2,221,715	51	2,324,900	51	2,614,600	51
Wyndmoor.....	11,778,483	295	12,247,900	295	13,118,500	295
Total.....	14,000,198	346	14,572,800	346	15,733,100	346
SOUTH CAROLINA						
Charleston.....	1,375,885	40	1,541,000	40	1,703,400	40
Clemson.....	2,081,774	35	1,993,800	35	2,094,600	35
Florence.....	1,590,108	39	1,417,000	39	1,573,100	39
Total.....	5,047,767	114	4,951,800	114	5,371,100	114
SOUTH DAKOTA						
Brookings-Madison...	1,448,541	35	1,334,100	35	1,399,900	35
TENNESSEE						
Greenville.....	66,651	1	74,200	1	78,000	1
Jackson.....	137,310	3	105,000	3	110,300	3
Knoxville.....	441,093	11	448,800	11	471,600	11
Lewisburg.....	124,668	4	137,000	4	143,900	4
Total.....	769,722	19	765,000	19	803,800	19
TEXAS						
Beaumont.....	577,510	15	619,900	15	651,600	15
Brownsville.....	1,418,937	31	1,144,900	31	1,203,200	31
Brownwood.....	459,957	13	375,200	13	394,400	13
Bushland.....	1,998,749	38	1,949,400	38	2,264,000	38
College Station.....	6,330,911	144	5,778,800	144	6,139,900	144
Houston.....	2,820,417	3	2,925,300	3	3,075,400	3
Kerrville.....	2,220,420	64	2,516,100	64	2,706,400	64
Lubbock.....	1,371,747	28	1,343,700	28	1,691,200	28
Mission.....	865,823	17	913,200	17	956,800	17
Temple.....	1,974,237	44	2,017,300	44	2,398,100	44
Weslaco.....	3,813,585	101	3,622,000	101	3,911,200	101
Total.....	23,852,293	498	23,205,800	498	25,392,200	498
UTAH, Logan.....	2,383,187	53	2,541,500	53	2,880,200	53

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1981		Estimated 1982		Estimated 1983	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
VIRGINIA						
Blacksburg.....	64,162	2	--	--	--	--
Richmond.....	192,917	5	176,700	5	185,100	5
Suffolk (Holland)...	425,288	11	409,700	11	429,500	11
Total....	682,367	18	586,400	16	614,600	16
WASHINGTON						
Prosser.....	1,550,232	40	1,466,000	40	1,644,400	40
Pullman.....	2,907,243	66	3,408,100	66	3,960,600	66
Wenatchee.....	1,355,612	23	1,154,500	23	1,211,600	23
Yakima.....	1,843,056	44	1,780,200	44	1,933,500	44
Total....	7,656,143	173	7,808,800	173	8,750,100	173
WEST VIRGINIA						
Beckley.....	1,014,342	13	1,520,000	13	1,671,900	13
Kearneysville.....	1,612,574	20	2,282,000	20	2,387,500	20
Total....	2,626,916	33	3,802,000	33	4,059,400	33
WISCONSIN, Madison...	3,153,604	42	3,828,000	42	4,395,200	42
WYOMING						
Cheyenne.....	1,130,671	21	700,700	21	735,500	21
Laramie.....	321,443	10	301,500	10	316,400	10
Total....	1,452,114	31	1,002,200	31	1,051,900	31
PUERTO RICO						
Mayaguez.....	935,649	33	767,100	33	948,400	33
Rio Piedras.....	345,290	7	360,000	7	378,000	7
Total....	1,280,939	40	1,127,100	40	1,326,400	40
VIRGIN ISLANDS						
St. Croix.....	256,688	10	275,200	10	288,800	10
OTHER COUNTRIES						
Argentina.....	192,119	--	155,400	--	163,400	--
France, Paris.....	464,790	1	508,500	1	534,400	1
Guatemala.....	70,993	1	63,000	1	70,800	1
Italy, Rome.....	377,754	2	357,800	2	376,200	2
Japan.....	107,919	1	146,600	1	154,100	1
Kenya.....	186,713	1	181,800	1	191,000	1
Netherlands, Rotherdam.....	309,429	2	334,800	2	352,000	2
Thailand.....	97,017	1	88,000	1	92,400	1
Total....	1,806,734	9	1,835,900	9	1,934,300	9

STATEMENT OF OBLIGATIONS AND STAFF-YEARS BY LOCATION

Location	Actual 1981		Estimated 1982		Estimated 1983	
	Dollars	Staff-Years	Dollars	Staff-Years	Dollars	Staff-Years
Extramural and Program locations to be determined.....	5,783,262	--	9,705,700	--	7,228,800	--
Contingency Research Fund.....	a/	--	1,000,000	--	1,000,000	--
Construction of Facilities.....	12,100,000	--	--	--	--	--
Repair & Maintenance of Facilities and Equipment.....	b/	--	8,216,000	--	8,504,000	--
Energy Retrofit.....	b/	--	2,500,000	--	2,588,000	--
Unobligated Balance..	5,359,031	--	--	--	--	--
Subtotal, Available or Estimate.....	417,801,864	8,523	425,288,000	8,506	468,156,000	8,456
Allotment to: Forest Service.....	297,136	2	390,000	2	392,000	2
Total, Available or Estimated.....	c/ 418,099,000	8,525	425,678,000	8,598	468,548,000	8,458

a/ Obligations for the \$1,000,000 appropriated in 1981 are included in the locations above.

b/ Obligations for repair and maintenance \$8,110,174, and energy retrofit, \$2,488,058, in 1981 are included in the locations above.

c/ Excludes \$8,732,000 for functions transferred to the Human Nutrition Information Service in 1982.



AGRICULTURAL RESEARCH SERVICE

The estimates include proposed changes in the Language of this item as follows: (new language underscored; deleted matter enclosed in brackets).

Building and Facilities

[For acquisition of land, construction, repair, improvement, extension, alteration, and purchases of fixed equipment or facilities of or used by the Agricultural Research Service, where not otherwise provided, \$8,596,000.]

The change proposes deletion of language authorizing acquisition of land, construction, repair, improvement, extension, alteration and purchases of fixed equipment or facilities at Boston, Massachusetts, Mission, Texas; and Grand Forks, North Dakota. Language for these activities will not be required in FY 1983.



Agricultural Research Service

Status of Construction Projects as of December 1981

Status of research facilities authorized in prior years, and reported as uncompleted in the 1982 Explanatory Notes, is as follows:

NOTE: (Design criteria provided by ARS to specify the program requirements and form the basis for negotiation of architect-engineer contracts. Diagrammatic drawings or concept drawings provide the basis for the first review of the architect's design. Tentative drawings or architect's design are provided by the architect for firming up cost estimates and basis for developing the completed, and final working drawings.) Beneficial occupancy of the facility occurs after substantial construction completion by the Contractor and when the tenant (researchers, scientists, and staff) move into and use the facility.)

<u>Location and Purpose</u>	<u>Year</u>	<u>Funds Provided Amount</u>	<u>Description</u>
<u>Colorado, Fort Collins</u>			
<u>Animal Disease Center</u>	1979 Plans.....	\$ 700,000	Design criteria and diagrammatic drawings were completed in the second quarter of fiscal year 1981.
<u>Indiana, West Lafayette</u>			
<u>Soil Erosion Center</u>	1978 Plans.....	400,000	Architect's design was completed in the fourth quarter of fiscal year 1979.
	1979 Construction....	3,600,000	Construction contract was awarded in the second quarter of fiscal year 1980.
	1979 Supplemental....	720,000	Construction completion and occupancy of the facility occurred in the fourth quarter of fiscal year 1981.
	Total.....	4,720,000	
<u>Massachusetts, Boston</u>			
<u>Adult Human Nutrition Laboratory</u>	1978 Plans.....	2,000,000	AE contract was awarded in fourth quarter of fiscal year 1978.
	1979 Construction....	21,100,000	Architect's design was completed in the fourth quarter of fiscal year 1979.
	1980 Redirection.....	2,187,000 f/	Construction contract for Phase I (site work and excavation) was awarded in the first quarter of fiscal year 1980 and was completed in the fourth quarter of fiscal year 1981.
	1982 Construction....	5,896,000	Construction contract for Phase II (laboratory building) was awarded in the third quarter of fiscal year 1981.
	Total.....	31,183,000	Construction completion is projected to be in the fourth quarter of fiscal year 1983.



Status of Construction Projects as of December 1981 (Cont.)

<u>Location and Purpose</u>	<u>Year</u>	<u>Funds Provided Amount</u>	<u>Description</u>
New York, Plum Island Additional Animal Laboratory Facilities	1973 Plans.....	\$ 250,000	Construction of the laboratory additions was halted in March 1979 due to contractor default. A contract was awarded in the second quarter of fiscal year 1980 for construction management services for the assessment, design, and construction of the laboratory additions. The in-place construction assessment and the construction of the vaccine storage warehouse were completed in the fourth quarter of fiscal year 1981. Design of the remaining facilities is continuing and should be completed by the fourth quarter of fiscal year 1982. Phased construction should begin in the third quarter of fiscal year 1982, and all construction is projected to be completed by the third quarter of fiscal year 1984. Project consists of completing the vaccine storage warehouse, entry and change facility, animal facility, and diagnostic research laboratory; and mothballing the vaccine research laboratory.
	1976 Construction...	10,000,000	
	1977 Redirection...	294,000 b/	
	1977 Redirection...	700,000 c/	
	1978 Redirection...	900,000 d/	
	1981 Construction...	10,100,000	
	Total.....	22,244,000	
North Dakota, Fargo Headhouse/Greenhouse	1980 Planning & Construction...	1,200,000	Design criteria were completed in the second quarter of fiscal year 1980. Design and construction contract by the University of North Dakota was completed in the third quarter of fiscal year 1980. Construction contract was awarded by the University of North Dakota in the third quarter of fiscal year 1980. Construction completion and occupancy of the facility occurred in the third quarter of fiscal year 1981.

Status of Construction Projects as of December 1981 (Cont.)

<u>Location and Purpose</u>	<u>Year</u>	<u>Funds Provided Amount</u>	<u>Description</u>
<u>North Dakota, Grand Forks</u> <u>Human Nutrition Research</u>	1976 Plans.....	\$ 225,000	AE contract was awarded in the fourth quarter of fiscal year 1978. Architect's design was completed in the third quarter of fiscal year 1979. Invitation of construction bids resulted in all bids exceeding funds available. Architect's redesign of a building of reduced scope was completed in the third quarter of fiscal year 1980. Construction of contract was awarded in the fourth quarter of fiscal year 1980. Construction completion of project is projected to be in the third quarter of fiscal year 1982.
	1978 Construction...	3,500,000	
	1980 Redirection....	389,000 g/	
	1982 Construction...	2,000,000	
	Total.....	<u>6,114,000</u>	
<u>Oklahoma, El Reno</u> <u>Feed Mill Replacement</u>	1978 Construction...	1,500,000 a/	Construction contract was awarded in the first quarter of fiscal year 1980. Construction completion is projected to be in the second quarter of fiscal year 1982.
	1979 Construction...	300,000	
	1980 Construction...	1,000,000	
	Total	<u>2,800,000</u>	
<u>Oklahoma, Stillwater</u> <u>Headhouse/greenhouse</u>	1979 Plans.....	170,000	AE contract was awarded in the fourth quarter of fiscal year 1979. Architect's design was completed in the third quarter of fiscal year 1980. Construction of contract was awarded in the fourth quarter of fiscal year 1980. Construction completion is projected to be in the second quarter of fiscal year 1982.
	1980 Construction...	1,700,000	
	1981 Construction...	1,000,000	
	Total.....	<u>2,870,000</u>	
<u>Texas, Lubbock</u> <u>Plant and Moisture</u> <u>Stress Laboratory</u>	1978 Feasibility Study.....	100,000	AE contract for design criteria document was awarded in the second quarter of fiscal year 1980 and completed in the fourth quarter of fiscal year 1980. The design contract for the central laboratory was awarded in the fourth quarter of fiscal year 1980. AE design of the central laboratory was completed in the first quarter of fiscal year 1982.
	1979 Plans.....	800,000	
	Total.....	<u>900,000</u>	

Status of Construction Projects as of December 1981 (Cont.)

<u>Location and Purpose</u>	<u>Years</u>	<u>Funds Provided Amount</u>	<u>Description</u>
<u>Texas, Mission</u> <u>Fever Tick Research</u>	1982 Planning and Construction	\$ 700,000	Design is expected to be completed in the third quarter of fiscal year 1982 and construction contract is expected to be awarded in the fourth quarter of fiscal year 1982. Construction completion is projected to be in the fourth quarter of fiscal year 1983.
<u>West Virginia, Beckley</u> <u>Soil and Water</u> Conservation Research	1972 Plans.....	70,000	Construction contract was awarded in the third quarter of fiscal year 1978. Construction completion was in the second quarter of fiscal year 1980. Additional funds in fiscal year 1981 were provided to construct facilities to protect research equipment. Award of construction is projected to be in fiscal year 1982.
	1973 Construction...	700,000	
	1976 Redirection....	40,000 e/	
	1977 Redirection....	1,509,000 c/	
	1981 Construction...	1,000,000	
	Total.....	3,319,000	
<u>West Virginia, Kearneysville</u> <u>Fruit Crops Research</u>	1973 Plans.....	200,000	AE contract was awarded in the first quarter of fiscal year 1974. Architect's design was completed in the fourth quarter of fiscal year 1976. Construction contract was awarded in the second quarter of fiscal year 1977. Construction contract was completed in the fourth quarter of fiscal year 1979. (Beneficial occupancy of facility was in May 1978.) Award of contract is projected in fiscal year 1982 for the purchase and installation of scientific research equipment.
	1976 Construction...	7,570,000	
	1977 Redirection....	-2,209,000 c/	
	Total.....	5,561,000	



Status of Construction Projects as of December 1981 (Cont.)

<u>Location and Purpose</u>	<u>Years</u>	<u>Funds Provided Amount</u>	<u>Description</u>
<u>Wisconsin, Madison</u> <u>Dairy Forage Research</u> <u>Center</u>	1978 Plans.....	\$1,100,000	This facility is located on Baraboo field site (military base). AE contract was awarded in the fourth quarter of fiscal year 1978. Architect's design was completed in the third quarter of fiscal year 1979. Construction contract was awarded in the fourth quarter of fiscal year 1979. Construction was completed in the fourth quarter of fiscal year 1980. Additional support facility construction is projected to be contracted for and completed by the fourth quarter of fiscal year 1982.
	1979 Construction...	9,000,000	
	Total.....	<u>10,100,000</u>	
			University of Wisconsin campus site: drawing received the first quarter of fiscal year 1979. Architect's design was completed in the fourth quarter of fiscal year 1979. Construction contract awarded in the first quarter of fiscal year 1980. Construction and occupancy of the facility were completed in the third quarter of fiscal year 1981.

Status of Construction Projects as of December 1981 (Cont.)

Footnotes:

- a/ Planning funds were not appropriated separately, but are included in the funds appropriated for construction.
- b/ \$194,000 was redirected from the air pollution abatement and sewage treatment project to provide funds for pollution abatement facilities in the animal and laboratory project as originally planned. An additional \$100,000 has been redirected into the animal and laboratory project from program funding.
- c/ Due to cost escalation and to provide funds to complete facilities as originally planned and designed at the Beckley, West Virginia project and the Plum Island animal and laboratory project, funds were redirected from Kearneysville, West Virginia.
- d/ Program funds in the amount of \$900,000 were reprogrammed to finance additional costs for this project.
- e/ Due to cost escalation, funds for the Ithaca, New York, project were redirected to Beckley, West Virginia, to provide sufficient funds to construct the facility.
- f/ Due to inflation and cost escalation, \$2,187,000 was redirected from program funds to finance additional costs for this project.
- g/ Program funds in the amount of \$389,000 were reprogrammed to finance additional costs for this project.

### Passenger Motor Vehicles

The 1983 Budget Estimate does not include the purchase of additional passenger motor vehicles above the 472 passenger motor vehicles presently owned.

The passenger motor vehicles of ARS are used by research scientists and staff personnel in the course of their daily work. These vehicles are operated chiefly at field stations engaged in research, and are used for travel where common carriers are seldom available. Vehicle use involves travel to individual farms, ranches, commercial firms, cooperating experiment stations, etc. The vehicles are essential for collecting experimental data and materials necessary for research work.

It is the policy of ARS to fully utilize motor vehicles to keep the number of vehicles to a minimum and reduce overall costs for maintenance.

Replacement of passenger motor vehicles. Replacement would be made of 118 of the 472 passenger motor vehicles (including 8 buses) operated at field stations engaged in research. It is estimated that all of the 118 passenger vehicles to be replaced will have mileage of more than 60,000 or be 7 or more years old.

Age and Mileage Data for passenger-carrying vehicles on hand as of September 30, 1981.

<u>Age-Year Model</u>	<u>Number of Vehicles*</u>	<u>Percent of Total</u>	<u>Lifetime Mileage (thousands)</u>	<u>Number of Vehicles*</u>	<u>Percent of Total</u>
1976+	221	47	80-over	38	8
1977	40	8	60-80	85	18
1978	66	14	40-60	119	25
1979	39	8	20-40	103	22
1980	69	15	Under 20	127	27
<u>1981</u>	<u>37</u>	<u>8</u>	<u>- -</u>	<u>- -</u>	<u>- -</u>
Total	472	100		472	100

\* Includes 7 vehicles used in foreign countries, and 8 buses.

### Aircraft

There will not be any additional acquisitions, nor will planned replacements be made of any of the seven aircraft owned by ARS in FY 1983. These aircraft are located at College Station, Texas, Weslaco, Texas, and Yakima, Washington. They are used in control methods, application of agricultural materials and infrared and color photography.





COOPERATIVE STATE RESEARCH SERVICE

Purpose Statement

Cooperative State Research Service participates in a nationwide system of agricultural research program planning and coordination between the States and the U.S. Department of Agriculture which encourages and assists in the establishment and maintenance of cooperation within and among the States and between the States and their Federal research partners. The primary function is the administration of grants and payments to States to supplement State and local funding for agricultural research carried on by the State agricultural experiment stations of the 50 States, Puerto Rico, Guam, the Virgin Islands, the District of Columbia, American Samoa, and Micronesia; by approved schools of forestry; the 1890 land-grant institutions and Tuskegee Institute; colleges of veterinary medicine; and other eligible institutions.

The program coordination and planning is carried out by a Cooperative State Research Service staff located entirely in the Washington, D. C. area. As of September 30, 1981, there were 123 full-time employees and 5 other employees.

COOPERATIVE STATE RESEARCH SERVICE

Available Funds and Staff-Years

1981 and Estimated, 1982 and 1983

Item	Actual 1981		Estimated Available, 1982		Budget Estimate, 1983	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Cooperative State Research Service ...	200,897,000	149	221,216,000	125	232,103,000	88
Obligations under other USDA						
appropriations:						
Office of International Cooperation						
and Development:						
Training .....	930	- -	- -	- -	- -	- -
Bioenergy systems and technology.	- -	- -	41,743	- -	- -	- -
Office of Environmental Quality,						
Commodity assessment of grapes ...	15,000	- -	- -	- -	- -	- -
Various research agencies sharing						
cost of Current Research						
Information System (CRIS) .....	- -	- -	389,000	8	425,000	6
Total, Other USDA Appropriations.	15,930	- -	430,743	8	425,000	6
Total, Agriculture						
Appropriations .....	200,912,930	149	221,646,743	133	232,528,000	94
Other Federal Funds:						
AID-PASA, Symbiotic nitrogen fixation:	662,674	- -	400,000	- -	400,000	- -
Department of Energy, Analysis of						
repository siting .....	600,000	- -	450,000	- -	- -	- -
National Institute of Mental Health,						
Health services profile .....	99,400	- -	- -	- -	- -	- -
Forest Service:						
Forest research .....	1,077,230	- -	600,000	- -	475,000	- -
Atmospheric deposition .....	36,000	- -	- -	- -	- -	- -
Forest pest program .....	35,000	- -	- -	- -	- -	- -
Environmental Protection Agency:						
Detail of scientist .....	10,090	- -	- -	- -	- -	- -
Imported fire ant .....	45,000	- -	- -	- -	- -	- -
Electrostatic sprayer .....	25,000	- -	- -	- -	- -	- -
Pesticide clearance .....	13,316	- -	- -	- -	- -	- -
Miscellaneous reimbursements .....	- -	- -	524,257	- -	962,000	- -
Total, Other Federal Funds .....	2,603,710	- -	1,974,257	- -	1,837,000	- -
Non-Federal Funds:						
State Agricultural Experiment						
Stations and 1890 Institutions,						
Sharing cost of Current Research						
Information System (CRIS) .....	- -	- -	195,000	4	213,000	2
Total, Cooperative State Research						
Service .....	203,516,640	149	223,816,000	137	234,578,000	96

	1981 Actual	1982 Estimated	1983 Estimated
Full-Time Equivalent Staff-Years:			
Ceiling .....	147	136	95
Non-ceiling .....	2	1	1
Total .....	149	137	96

COOPERATIVE STATE RESEARCH SERVICE  
Permanent Positions by Grade and Staff-Year Summary  
1981 and Estimated 1982 and 1983

Grade	1981			1982			1983		
	Headquarters	Field	Total	Headquarters	Field	Total	Headquarters	Field	Total
ES-6	1	-	1	1	-	1	1	-	1
ES-4	5	-	5	5	-	5	5	-	5
GS/GM-15	37	-	37	35	-	35	24	-	24
GS/GM-14	8	-	8	9	-	9	6	-	6
GS/GM-13	6	-	6	8	-	8	6	-	6
GS-12	3	-	3	6	-	6	4	-	4
GS-11	6	-	6	8	-	8	6	-	6
GS-9	5	-	5	7	-	7	5	-	5
GS-7	14	-	14	13	-	13	9	-	9
GS-6	26	-	26	25	-	25	17	-	17
GS-5	21	-	21	21	-	21	14	-	14
GS-4	4	-	4	6	-	6	4	-	4
GS-3	2	-	2	3	-	3	2	-	2
Other Graded Positions.....	-	-	-	-	-	-	-	-	-
Ungraded Positions...	-	-	-	-	-	-	-	-	-
Total Permanent Positions.....	138	-	138	147	-	147	103	-	103
Staff-years:									
Ceiling.....	147	-	147	136	-	136	95	-	95
Non-Ceiling.....	2	-	2	1	-	1	1	-	1
Total.....	149	-	149	137	-	137	96	-	96

COOPERATIVE STATE RESEARCH SERVICE

CLASSIFICATION BY OBJECTS

1981 and Estimated 1982 and 1983

	<u>1981</u>	<u>1982</u>	<u>1983</u>
Personnel Compensation:			
Headquarters.....	\$3,452,531	\$3,741,000	\$2,737,000
Field.....	<u>- -</u>	<u>- -</u>	<u>- -</u>
11 Total personnel Compensation.....	3,452,531	3,741,000	2,737,000
12 Personnel Benefits	<u>316,691</u>	<u>345,000</u>	<u>249,000</u>
Total Pers. Comp. & Benefits.....	3,769,222	4,086,000	2,986,000
Other Objects:			
21 Travel.....	402,037	408,000	342,000
22 Transportation of things.....	12,533	14,000	15,000
23.1 Standard Level User Charges.....	221,272	264,000	301,000
23.2 Communications, utilities and other rent.....	575,581	663,000	697,000
24 Printing and reproduction.....	80,748	87,000	91,000
25 Other services.....	2,328,670	2,554,000	3,428,000
26 Supplies and materials.....	80,365	85,000	89,000
31 Equipment.....	89,328	96,000	101,000
41 Grants, subsidies and contributions....	<u>191,823,122</u>	<u>212,959,000</u>	<u>224,053,000</u>
Total Other Objects...	<u>195,613,656</u>	<u>217,130,000</u>	<u>229,117,000</u>
Total direct obligations	<u>199,382,878</u>	<u>221,216,000</u>	<u>232,103,000</u>
<u>Position Data:</u>			
Average Salary, ES positions.....	\$50,112	\$58,500	\$58,500
Average Salary, GS positions.....	\$27,522	\$29,010	\$29,096
Average Grade, GS positions.....	9.64	9.62	9.67



COOPERATIVE STATE RESEARCH SERVICE

The estimates include appropriation language for this item as follows (new language underscored; deleted matter enclosed in brackets):

Cooperative State Research Service

- For payments to agricultural experiment stations, for cooperative forestry and other research, for facilities, and for other expenses, including [\$141,109,000] \$144,495,000 to carry into effect the provisions of the Hatch Act, approved March 2, 1887, as amended by the Act approved August 11, 1955 (7 U.S.C. 361a-361i), and further amended by Public Law 92-318 approved June 23, 1972, and further amended by Public Law 93-471 approved October 26, 1974, including administration by the United States Department of Agriculture, and penalty mail costs of agricultural experiment stations under section 6 of the Hatch Act of 1887, as amended, and payments under section 1361(c) of the Act of October 3, 1980 (7 U.S.C. 301n.); [\$12,031,000] \$10,807,000 for grants for cooperative forestry research under the Act approved October 10, 1962 (16 U.S.C. 582a--582a-7), as amended by Public Law 92-318 approved June 23, 1972, including administrative expenses and payments under section 1361(c) of the Act of October 3, 1980 (7 U.S.C. 301n.); [\$21,492,000] \$21,674,000 for payments to the 1890 land-grant colleges, including Tuskegee Institute, for research under section 1445 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (Public Law 95-113), as amended, including administration by the United States Department of Agriculture, and penalty mail costs of the 1890 land-grant colleges, including Tuskegee Institute; [\$21,899,000] \$44,304,000 for contracts and grants for agricultural research under the Act of August 4, 1965, as amended (7 U.S.C. 450i) [; \$16,320,000], of which \$21,424,000 is for special research grants, and \$22,880,000 is for competitive research grants, including administrative expenses;
- 1 [\$5,760,000 for the support of animal health and disease research programs authorized by section 1433 of Public Law 95-113, including administrative expenses;] \$540,000 for grants in accordance with section 1419 of Public Law 95-113, as amended; \$702,000 for research authorized by the Native Latex
- 2 Commercialization and Economic Development Act of 1978; \$8,800,000 for grants to upgrade 1890 land-grant college research facilities as authorized by section 1433 of Public Law 97-98; and [\$1,363,000] \$781,000 for necessary expenses of Cooperative State Research Service activities, including administration of payments to State agricultural experiment stations, funds for employment pursuant to the second sentence of section 706(a) of the Organic Act of 1944 (7 U.S.C. 2225), and not to exceed \$50,000 for employment under 5 U.S.C 3109; in all, [\$221,216,000] \$232,103,000.
- 3

The first change adds language which delineates fund distribution for special research grants and competitive research grants.

The second change deletes language for animal health and disease research programs authorized by section 1433 of Public Law 95-113. No funding is proposed for this program in fiscal year 1983.

The third change adds language for grants to upgrade 1890 land-grant college research facilities.



COOPERATIVE STATE RESEARCH SERVICE

Appropriation Act, 1982 .....	\$221,216,000
Budget Estimate, 1983 .....	232,103,000
Increase in Appropriation .....	<u>+10,887,000</u>

SUMMARY OF INCREASES AND DECREASES

<u>Item of Change</u>	<u>1982</u> <u>Estimated</u>	<u>Program Changes</u>	<u>1983</u> <u>Estimated</u>
Payments under the Hatch Act .....	\$141,109,000	+\$3,386,000	\$144,495,000
Cooperative forestry research .....	12,031,000	-1,224,000	10,807,000
Payments to 1890 colleges and Tuskegee Institute .....	21,492,000	+182,000	21,674,000
Special research grants .....	23,141,000	-475,000	22,666,000
Competitive research grants .....	16,320,000	+6,560,000	22,880,000
Animal health and disease research, section 1433 .....	5,760,000	-5,760,000	- -
Federal administration (direct appropriation) .....	1,363,000	-582,000	781,000
1890 Facilities .....	- -	+8,800,000	8,800,000
TOTAL AVAILABLE .....	<u>221,216,000</u>	<u>+10,887,000</u> a/	<u>232,103,000</u>

a/ Includes a total increase of \$3,568,000 toward increased operating costs in order to sustain performance levels for continuing programs. Includes a total increase of \$232,000 for the portion of pay increases effective in FY 1982 which was absorbed in FY 1982 which is needed to carry out the programs proposed in FY 1983.

PROJECT STATEMENT

Project	1981		1982 (estimated)		Increase or Decrease	1983 (estimated)	
	Amount	Staff Years	Amount	Staff Years		Amount	Staff Years
1. Payments under the Hatch Act:							
a. Research program:							
Formula funds ..	\$94,614,464:		\$104,205,308:		+\$2,437,920	\$106,643,228:	
Regional research:	29,256,471:		32,444,313:		+846,500	33,290,813:	
Subtotal .....	123,870,935:		136,649,621:		+3,284,420	139,934,041:	
b. Penalty Mail ....	421,023:		476,000:		- -	476,000:	
c. Federal adminis- tration (3%) ...	3,449,928:		3,983,379:		+101,580	4,084,959:	
Total, Hatch Act ...	127,741,886:	84	141,109,000:	68	+3,386,000(1)	144,495,000:	49
2. Cooperative forestry research 1/ .....	10,774,000:	7	12,031,000:	6	-1,224,000(2)	10,807,000:	4
3. Payments to 1890 colleges and Tuskegee Institute 1/ .....	18,642,115:	12	21,492,000:	10	+182,000(3)	21,674,000:	7
4. Special research grants:							
Soil erosion in Pacific Northwest.	600,000:		622,000:		- -	622,000:	
Dried bean research in North Dakota ..	25,000:		24,000:		-24,000	- -	
Food and agriculture policies .....	150,000:		156,000:		- -	156,000:	
Soybean research ..	500,000:		518,000:		- -	518,000:	
Integ. pest manage- ment (consortium).	1,500,000:		3,091,000:		-480,000	2,611,000:	
Biological control of pests.....	- -		480,000:		- -	480,000:	
Pesticide clearance	1,250,000:		1,680,000:		- -	1,680,000:	
Pesticide impact assessment .....	1,810,000:		2,069,000:		- -	2,069,000:	
Rural development centers .....	300,000:		311,000:		- -	311,000:	
Soybean cyst nema- tode research in Missouri.....	250,000:		240,000:		-240,000	- -	
Bean and beet re- search in Michigan	75,000:		82,000:		-82,000	- -	
Mushroom byproduct utilization re- search-Pennsylvania:	38,000:		- -		- -	- -	
Animal health research .....	5,050,000:		7,156,000:		- -	7,156,000:	
Energy research ...	1,900,000:		960,000:		-960,000	- -	
Aquaculture research at Stoneville, Mississippi .....	150,000:		240,000:		-240,000	- -	
Dairy photoperiod research-Michigan.	35,000:		34,000:		-34,000	- -	
Soil and water con- servation-Alaska .	290,000:		- -		- -	- -	
Bean flour research- Texas & Michigan .	103,000:		99,000:		-99,000	- -	
Aquaculture research:	500,000:		518,000:		- -	518,000:	
Antidesertification research .....	1,000,000:		1,037,000:		- -	1,037,000:	
Germplasm resources	500,000:		902,000:		- -	902,000:	
Peach tree short life research, South Carolina.....	100,000:		192,000:		-192,000	- -	
Blueberry shoestring virus , Michigan..	100,000:		96,000:		-96,000	- -	
Food quality and safety research....	- -		384,000:		- -	384,000:	



Project	1981		1982 (estimated)		Increase or Decrease	1983 (estimated)	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
Mount St. Helens research: .....	\$850,000		- -		- -	- -	
Ash effects on ag. and hort. crops.	(400,000)		- -		- -	- -	
Ash effects on soil complexes .	(200,000)		- -		- -	- -	
Ash effects on water quality ..	(100,000)		- -		- -	- -	
Ash effects on animals .....	(150,000)		- -		- -	- -	
Control of perennial weeds, Stoneville, Mississippi .....	- -		\$144,000		-\$144,000	- -	
Mosquito research, Riceland Agroeco- system .....	- -		480,000		-480,000	- -	
Small farm research center study, Oklahoma .....	- -		24,000		-24,000	- -	
TCK smut (wheat) ..	- -		288,000		-288,000	- -	
Sunflower midge, North Dakota .....	- -		72,000		-72,000	- -	
Tropical & sub- tropical research.	- -		- -		+2,980,000	\$2,980,000	
Subtotal, Special research grants.	17,076,000		21,899,000		-475,000(4)	21,424,000	
Alcohol fuels re- search (Section 1419, PL 95-113) .	500,000		540,000		- -	540,000	
Native Latex Act (PL 95-592) .....	650,000		702,000		- -	702,000	
Total 1/ .....	18,226,000	19	23,141,000	16	-475,000	22,666,000	12
5.Competitive research grants:							
Plant science.....	13,000,000		13,440,000		+6,440,000	19,880,000	
Human nutrition ...	3,000,000		2,880,000		+120,000	3,000,000	
Total, Competitive research grants 1/:	16,000,000	22	16,320,000	20	+6,560,000(5)	22,880,000	15
6.Animal health and disease research, section 1433 2/ ...	6,500,000	4	5,760,000	4	-5,760,000(6)	- -	- -
7.Federal administra- tion (direct appro.)	1,498,877	1	1,363,000	1	-582,000(7)	781,000	1
8.1890 Facilities 2/ .	- -	- -	- -	- -	+8,800,000(8)	8,800,000	- -
Unobligated balance ..	1,514,122	- -	- -	- -	- -	- -	- -
Total available or estimate .....	200,897,000	149	221,216,000	125	+10,887,000	232,103,000	88

1/ Includes 3% set-aside for Federal administration.

2/ Includes 4% set-aside for Federal administration.

### EXPLANATION OF PROGRAM

The Agriculture, Rural Development, and Related Agencies Appropriations Act of 1982 funds Cooperative State Research Service activities authorized under the following Acts:

1. Payments to agricultural experiment stations under the Hatch Act, and for penalty mail - Agricultural Experiment Stations Act of August 11, 1955, Hatch Act of 1887 as amended - 7 U.S.C. 361a-361i; Education Amendments of 1972, Public Law 92-318, June 23, 1972; Public Law 93-471, October 26, 1974; Public Law 95-113, September 29, 1977, as amended; and Public Law 96-374, October 3, 1980.

The Act of August 11, 1955, as amended, provides that the distribution of Federal payments to States for fiscal year 1955 shall become a fixed base and that any sums appropriated in excess of the 1955 level shall be distributed in the following manner:

- 20% shall be allotted equally to each State.
- not less than 52% shall be allotted to the States as follows:
  - one-half in an amount proportionate to the relative rural population of each State to the total rural population of all States, and
  - one-half in an amount proportionate to the relative farm population of each State to the total farm population of all States.
- not more than 25% shall be allotted to the States for cooperative research in which two or more State agricultural experiment stations are cooperating to solve problems that concern the agriculture of more than one State.
- 3% shall be available to the Secretary of Agriculture for the administration of this Act.

The Act also provides that any amount in excess of \$90,000 available for allotment to any State, exclusive of the regional research fund, shall be matched by the State out of its own funds for research, and for the establishment and maintenance of facilities necessary for the performance of such research.

The Hatch Act provides for the mailing under penalty indicia by agricultural experiment stations of bulletins, reports, periodicals, reprints of articles, and other publications, including lists of publications necessary for dissemination of results of research. Mailings include not only those to individual farmers upon request but also to newspapers, libraries, other experiment stations, and organizations interested in results of research and dissemination of such results. Under Title 39 U.S.C. 3206(b) and 3203(a)(4), the Department paid to the U.S. Postal Service \$421,023 to cover postage of mail sent under the penalty privilege by the State agricultural experiment stations during fiscal year 1981. Funds of \$476,000 have been set-aside from the fiscal year 1982 appropriation and the fiscal year 1983 budget under the Hatch Act for payments to the U.S. Postal Service.

Three percent of funds appropriated under the Hatch Act is set-aside for Federal administration. Administration includes disbursement of funds and a continuous review and evaluation of the research programs of the State agricultural experiment stations supported wholly or in part from Hatch funds. Cooperative State Research Service encourages and assists in the establishment of cooperation within and between the States, and also actively participates in the planning and coordination of research programs between the States and the Department at the regional and national level.

2. Cooperative Forestry Research - The Cooperative Forestry Research Act of October 10, 1962, 16 U.S.C. 582a-7; Education Amendments of 1972, Public Law 92-318, June 23, 1972; Public Law 96-374, October 3, 1980.

The Act authorizes funding of research in State institutions certified by a State representative designated by the governor of each State. The Act provides that appropriated funds be apportioned among States as determined by the Secretary after consultation with a national advisory board of not less than seven officials of the forestry schools of the State-certified eligible colleges and universities chosen by a majority of those schools. Determination of apportionments follows consideration of pertinent factors including, but not limited to, areas of non-Federal commercial forest land and volume of timber cut from growing stock. The Act also limits the payments to the amount made available and budgeted from non-Federal sources by the certified institutions for expenditure for forestry research. Three percent of funds appropriated under this Act is set-aside for Federal administration.

3. Payments to 1890 Colleges and Tuskegee Institute - The National Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1445, Public Law 95-113, September 29, 1977; Public Law 95-547, October 28, 1978.

Public Law 95-113, as amended, provides for support of continuing agricultural research at colleges eligible to receive funds under the Act of August 30, 1890, including Tuskegee Institute. Beginning with fiscal year 1979, there shall be appropriated funds for each fiscal year, an amount not less than 15% of the total for such year under Section 3 of the Act of March 2, 1887. These funds shall be distributed as follows:

- 3% shall be available to the Secretary of Agriculture.
- Payments to States in fiscal year 1978 is a fixed base. Of funds in excess of this amount:
  - 20% shall be allotted equally to each State.
  - 40% shall be allotted in an amount proportionate to the rural population of the State in which the eligible institution is located to the total rural population of all the States in which eligible institutions are located, and
  - 40% shall be allotted in an amount proportionate to the farm population of the State in which the eligible institution is located to the total farm population of all the States in which eligible institutions are located.

Allotments to Tuskegee Institute and Alabama A&M University shall be determined as if each institution were in a separate State. Three percent of the funds appropriated under this Act is set aside for Federal administration. This includes disbursements of funds and review and evaluation of proposals.

4. Special Research Grants - Section 2(c), Act of August 4, 1965, 7 U.S.C. 450i as amended by Public Law 95-113, September 29, 1977; Section 1419, Public Law 95-113, as amended by Public Law 96-294, June 30, 1980; and Public Law 95-592, November 4, 1978.

Section 2 of the Act of August 4, 1965, as amended, authorizes Special Research Grants for periods not to exceed five years to land-grant colleges and universities, State agricultural experiment stations, and to all colleges



and universities having a demonstrable capacity in food and agricultural research to further the programs of the Department of Agriculture. Special Research Grants are awarded on the discretionary basis as well as using a competitive peer panel process in the selection of proposals to be funded. In fiscal year 1983, \$21,424,000 is requested for this program. In addition, \$540,000 is for Alcohol Fuels Research Grants in accordance with Section 1419 of Public Law 95-113, and \$702,000 is for research under the Native Latex Commercialization and Economic Development Act of 1978.

Research on food and agriculture policies, soybeans, pesticide clearance, soil erosion in the Pacific Northwest, pesticide impact assessment, animal health, rural development centers, integrated pest management, aquaculture, antidesertification, germplasm resources, biological control of pests, food quality and safety, and tropical and subtropical will receive emphasis in FY 1983.

Research on alcohol fuels is also carried out in accordance with Section 1419 of Public Law 95-113, as amended by Public Law 96-294, June 30, 1980. Research will also be carried out under the Native Latex Commercialization and Economic Development Act of 1978, Public Law 95-592.

5. Competitive Research Grants - Section 2(b), Act of August 4, 1965, 7 U.S.C. 450i as amended by Public Law 95-113, September 29, 1977.

Section 2 of the Act of August 4, 1965 as amended, authorizes Competitive Grants for periods not to exceed five years to State Agricultural Experiment Stations, all Colleges and Universities, other research institutions and organizations, Federal agencies, private organizations or corporations and individuals to further the programs of the Department of Agriculture. By obtaining the participation of outstanding researchers in the entire U.S. scientific community, emphasis will be placed on basic research critical to food production and human nutrition including biological stress of plants, genetic mechanisms of plants, plant nitrogen fixation, plant photosynthesis, plant metabolism and human nutrient requirements.

6. Animal Health and Disease Research - The National Agricultural Research, Extension, and Teaching Policy Act of 1977, Section 1433, Public Law 95-113, September 29, 1977.

Section 1433 provides for support of livestock and poultry disease research in colleges of veterinary medicine and in eligible State agricultural experiment stations. These funds shall be distributed as follows:

- 4% shall be retained by the Department of Agriculture for administration, program assistance to the eligible institutions, and program coordination.
  - 48% shall be distributed in an amount proportionate to the value of and income to producers from domestic livestock and poultry in each State to the total value of and income to producers from domestic livestock and poultry in all the States.
  - 48% shall be distributed in an amount proportionate to the animal health research capacity of the eligible institutions in each State to the total animal health research capacity in all the States.
- Eligible institutions must provide non-Federal matching funds in States receiving annual amounts in excess of \$100,000 under this authorization.

7. Federal Administration (direct appropriation) - Authority for direct appropriations is provided in the annual Agriculture, Rural Development, and Related Agencies Appropriations Act. These funds are used to provide support services in connection with research planning and coordination of all programs administered by Cooperative State Research Service.



8. Grants to Upgrade 1890 Land-Grant College Research Facilities. National Agricultural Research, Extension, and Teaching Policy Act Amendments of 1981, Section 1433, Public Law 97-98, December 22, 1981.

Section 1433 of the Act authorizes funds for grants to the institutions eligible to receive funds under the Act of August 30, 1890, including Tuskegee Institute, for the acquisition and improvement of research facilities and equipment. Four percent of the sums appropriated shall be available to the Secretary for administration of the grant program. The remaining funds shall be available for grants to the eligible institutions for the purpose of assisting them in the purchase of equipment and land, and the planning, construction, alteration, or renovation of buildings to strengthen their capacity to conduct research in the food and agricultural sciences.

JUSTIFICATION OF INCREASES AND DECREASES

- (1) An increase of \$3,386,000 for payments to States under the formula provisions of the Hatch Act for increased operating costs (\$141,109,000 available in FY 1982).

Need for Change. The research conducted by State agricultural experiment stations has been cooperative with that performed by Federal researchers in contributing to the high level and efficiency of food and fiber production. Each of the States has developed research expertise to match the profile of the State's agriculture. Studies have shown that the effectiveness of research is enhanced by intimate knowledge of the characteristics of the production area, and close interaction among the researchers and research users. While research programs have a major long-term impact on reducing inflation, these programs are victims of inflation-induced rising costs. Research costs including salaries and benefits, services, materials, and equipment continue to increase due to inflation. If the costs of inflation are not offset, the State agricultural experiment stations will lose flexibility to respond to the highest priority research needs of the food and agriculture sector.

Nature of Change. This increase in funding will provide for a portion of the increased operating costs in the State agricultural experiment stations. This will assist the State agricultural experiment stations to maintain strong base programs across a broad spectrum of high priority research areas.

- (2) A decrease of \$1,224,000 in payments to States for Cooperative Forestry Research (\$12,031,000 available in FY 1982).

Need for Change. Due to the need for constraints in Federal funding for Fiscal Year 1983, it is necessary to reduce the level of funding in support of many of the high priority research programs of the States being supported in part with Federal funds. While the importance of forestry research is recognized at the national level, it is necessary under the budget constraints to provide support for this program at a reduced level.

Nature of Change. This change will reduce the Federal portion of this program by approximately 10 percent. Amounts allotted to the States on a formula basis permit the State institutions to fund research in those areas they identify as highest priority and maintain strong programs in those selected areas.

- (3) An increase of \$182,000 for research at 1890 Colleges and Tuskegee Institute for increased operating costs (\$21,492,000 available in FY 1982).

Need for Change. The research conducted by the 1890 Colleges has been cooperative with that performed by Federal researchers and State agricultural experiment stations in contributing to the high level of efficiency of food and fiber production. Each of the 1890 Colleges has developed research expertise to match the profile of the State's agriculture. Studies have shown that the effectiveness of research is enhanced by intimate knowledge of the characteristics of the production area, and close interaction among the researchers and research users.

While research programs have a major long-term impact on reducing inflation, these programs are victims of inflation-inducing rising costs. If the costs of inflation are not offset, the 1890 Colleges will lose their flexibility to respond to the highest priority research needs of the food and agriculture sector.

Nature of Change. This increase in funding will provide for a portion of the increased operating costs at the 1890 Colleges and Tuskegee Institute. This will assist these institutions to maintain strong base programs across a broad spectrum of high priority research areas.

- (4) A net decrease of \$475,000 for Special Research Grants as follows:  
(\$21,899,000 available in FY 1982).

- (a) An increase of \$2,980,000 for Special Research Grants for  
tropical and subtropical agricultural research (no funds available  
in FY 1982).

Need for Change. This research program is to strengthen and improve the research capability for solving food and agricultural problems in tropical and subtropical areas. Research would be conducted on crop and animal productivity and protection, land and water resources for agricultural productivity, economics and marketing, post-harvest physiology and storage, and other areas as needed.

The Special Research Grant program will continue support for a research program that was formerly managed by ARS for several years with advice from the National Advisory Group, the Pacific Basin Advisory Group, and Caribbean Basin Advisory Group. The advisory groups consist of officials from USDA, SAES, and U.S. universities. These groups plan and coordinate the program as well as review and select project proposals for funding. Special Research Grants will be awarded on a discretionary basis to institutions designated by the advisory groups to promote productive agricultural technology under tropical and subtropical environments.

Nature of Change. The funding will increase research capability to improve production and protection systems for crops and animals under tropical and subtropical environments; develop means for efficient handling, marketing, and exporting perishable commodities; and expand knowledge of tropical and subtropical environments and productivity factors.

- (b) A decrease of \$3,455,000 for selected Special Research Grants  
(\$6,066,000 available in FY 1982) consisting of:

Dried bean research in North Dakota.....	-\$24,000
Integrated pest management research.....	-480,000
Soybean cyst nematode research in Missouri.....	-240,000
Bean and beet research in Michigan.....	-82,000
Energy research.....	-960,000
Aquaculture at Stoneville, Mississippi.....	-240,000
Dairy photoperiod research in Michigan.....	-34,000
Bean flour research at Texas and Michigan.....	-99,000
Peach tree short life, South Carolina.....	-192,000
Blueberry shoestring virus, Michigan.....	-96,000
Control of perennial weeds, Stoneville, Miss.....	-144,000



Mosquito research, Riceland agroecosystem.....	-480,000
Small farm research center study, Oklahoma.....	-24,000
Sunflower midge, North Dakota.....	-72,000
TCK smut (wheat).....	-288,000
	<u>-3,455,000</u>

Need for Change. This decrease realigns research effort of this grant program at this time. Prior funding under this program has already directed attention to these areas and the research grants funded in Fiscal Year 1982 and prior years will be used over a period of up to five years for completion of studies. The level of funding and the time period of support provided by these grants will yield important information. As results of this research become known, an assessment can be made of the need for augmenting this base of scientific knowledge developed by these programs.

Nature of Change. This change will reduce the level of funding or terminate special research grant funding of the specific areas of research identified above. Amounts allotted to the States on a formula basis permit State institutions to fund research in those areas that they identify as high priority and could be a possible source of funding for these programs if the States wish to continue the research.

(5) An increase of \$6,560,000 for Competitive Research Grants as follows:

(a) An increase of \$6,440,000 for Competitive Research Grants for plant science research (\$13,440,000 available in FY 1982).

Need for Change. During Fiscal Years 1978-1981, the first four years of operation of this program, 2,518 basic research proposals in four areas of plant science were received. Funding requested to support the research outlined in the 2,518 research proposals totaled approximately \$390 million. Over half of the research proposals submitted were judged by peer panels of practicing research scientists to be worthy of support. However, less than a quarter of the applications were funded even though the duration of the projects and the support per year were reduced substantially from those proposed by the applicants. The data for the four-year period indicate that there is a vast resource of available scientific expertise capable of designing and conducting fundamental research on the highest priority problems related to crop, food, and fiber production to obtain fundamental knowledge necessary to increase crop productivity and to insure a dependable food supply. The increased funding proposed for FY 1983 will permit utilizing this vast resource of scientific expertise to provide a broader spectrum of research approaches in the four areas that received major emphasis during the first four years, and to initiate a new program on plant metabolism as influenced by environmental stresses.

Biological Nitrogen Fixation. Enhancement of biological nitrogen fixation capacity in plant-soil-microbial associations is of major importance. Nitrogen is the element that most commonly limits crop production and nitrogen fertilizers are expensive and represent a large energy input to crop production. Major emphasis has been given to research aimed at understanding nitrogen fixing mechanisms in both symbiotic and free-living organisms. The enzymes involved in nitrogen metabolism are being localized in the cell. Individual genetic components of the



nitrogen fixing genes are being isolated and their products are being biochemically characterized. The nature of the symbiotic relationship and the mechanisms by which organisms improve the efficiency of the nitrogen fixation process have been partially elucidated. Additional studies on the metabolic fate of fixed nitrogen in the plant-soil-microbe ecosystem are needed.

Photosynthesis. Photosynthesis involves the biological conversion of solar energy and atmospheric carbon dioxide into products useful to man. Major areas of study are the absorption of sunlight and transfer of its energy to several pigment systems, the structure and function of photosynthetic membranes responsible for formation of high energy compounds, and the regulation of carbon dioxide fixation and distribution of photosynthetic products within the plant. The details of protein structure in some elements responsible for energy conversion in the photosynthetic membrane are being studied. These elements called coupling factors, are responsible for the synthesis of adenosine triphosphate, a stable high energy compound used by all living cells as a chemical fuel for accomplishing chemical work. Research needs to be expanded to investigate the regulation of key processes involved in photosynthesis and to apply new recombinant DNA technology to studies on genetics of chloroplast components.

Genetic Mechanisms for Crop Improvement. The development of innovative and unique genetic approaches for gene transfer and modification of gene expression in plants has been a major thrust of this program. Studies are underway involving all major crops at the molecular, cellular and whole plant level. Major areas of emphasis include studies on plant gene structure and regulation; composition; biosynthesis and accumulation of seed protein; and basic genetic and cytogenetic studies on transfer, incorporation and utilization of alien genes from wild germplasm following wide crosses and embryo culture. Opportunities now exist for combining plant breeding and expertise in microscopy to provide an understanding at the cytological level of the impact of individual members of the chromosome set. The molecular biology of several different genetic vehicles for incorporating desired genes into crop plants is being investigated. There are few cases where plantlets can be obtained from protoplasts. Fundamental research on regulatory mechanisms controlling outgrowth and differentiation of such cells is limited; these mechanisms must be well understood before recombinant DNA technology can be used widely to engineer crop plants. Progress has been made using recombinant DNA technology in gaining an understanding of gene structure and regulation in crop plants.

Biological Stress on Plants. Crop losses due to biological stress may run as high as one-third of the actual yield. Pests such as insects, nematodes, weeds, and pathological microorganisms damage plants and reduce yields by interfering with key processes of plant growth. The major emphasis of this program has been on the interactions of pests with the host plant. The form and function of plant viruses and other microbes, the mechanisms of action of fungal toxins, and the physiology of the host-pathogen interactions are under investigation. There is a need to initiate additional research using molecular techniques to define the mechanisms of action of bacterial pathogenicity, and investigations on the metabolic

changes occurring in the host plant when an insect or pathogen interacts with the host plant.

Plant Metabolism and Environmental Stresses. Research will be initiated in the area of plant metabolism as affected by environmental stresses. Environmental stresses affecting crop production include temperature extremes, insufficient water and high soil salinity. Research is needed to investigate the main sites of response to stress in the plant such as the structure and function of various membrane systems, energy transfer systems, enzyme activity and hormonal regulation of the response. Technical problems in isolating pure plant membranes whose structure or function has not been altered during isolation have hindered the characterization of plant membranes and their structure-function relationships.

Nature of Change. Research under the biological nitrogen fixation program will be expanded to learn more about the mechanisms of nitrogen fixation, the nature of the symbiotic relationship, and the metabolic fate of fixed nitrogen in the plant-soil-microbe ecosystem.

Photosynthesis research will include investigations on the regulation of key processes involved in photosynthesis and the application of new recombinant DNA technology to studies on genetics of chloroplast components.

The increased program on genetic mechanisms for crop improvement will emphasize the identification and application of new gene introduction vehicles, development of better methods for growing out whole plants from genetically engineered single isolated cells, and the further identification of plant characters or genes that are significant targets for genetic manipulation.

Research on biological stress on plants will be expanded to include molecular techniques to define the mechanisms of action of bacterial pathogenicity. Metabolic changes occurring in the host plant in response to an interaction with an insect or pathogen will be investigated.

The effect of environmental stress on plant metabolism will be studied by use of physical and biochemical techniques to examine structure and function of various membranes and organelles in response to stress. Changes in hormones will be studied with recently developed techniques that employ high performance liquid chromatography. Other changes in metabolism will be determined using biochemical assays of enzyme activities and metabolite levels.

- (b) An increase of \$120,000 for Competitive Research Grants for human nutrition research (\$2,880,000 available in FY 1982).

Need for Change. During the first four years of operation of this program, Fiscal Years 1978-1981, 840 basic research proposals in human nutrition were received. The amount requested to support this proposed research was approximately \$159 million. Less than 20 percent of the proposals could be funded with available funds. During the first four years of operation, this research has focused primarily on two areas, improvement and development of analytical techniques and the study of trace mineral availability and functions. Projects supported by this

program have successfully generated new methods for trace mineral analysis using non-radioactive heavy isotopes in place of potentially dangerous radioactive isotopes. Basic studies on the influence of dietary fiber and other substances on trace mineral availability are yielding data vital to effective nutrition counseling. It is becoming evident that the rapid and efficient development and operation of the immune systems is highly intertwined with nutrient supply and balance but more work is necessary to clarify and quantify these relationships. Basic research is also needed to devise appropriate means of assessing nutrient adequacy and to determine the consequences of inappropriate nutrient balance or intake.

Nature of Change. Research will focus on the nutrient requirements of the adolescent and elderly persons. Studies will be undertaken to develop appropriate techniques for assessing the adequacy of nutrient intake. The interaction of nutrition with disease resistance will be explored.

- (6) A decrease of \$5,760,000 for Animal Health and Disease Research, Sec. 1433, P.L. 95-113 (\$5,760,000 available in FY 1982).

Need for Change. Seventy-eight institutions are currently eligible to receive payments under formula provisions of this program first funded in FY 1979. The level of appropriated Federal funds has not been adequate to support a viable program across the eligible institutions. Animal health and disease research will continue to be conducted by Federal and State research institutions under other authorizations which provide opportunity for more concentrated efforts in solving a limited number of high priority problems of national significance.

Nature of Change. This portion of the animal health and disease research program is proposed for elimination. Ongoing Federal and State research programs will sustain the overall animal health and disease research efforts in many of the high priority areas. Research initiated under this program can be continued by the States as part of their ongoing programs if they so desire.

- (7) A net decrease of \$582,000 for Federal Administration (direct appropriation) (\$1,363,000 available in FY 1982).

- (a) An increase of \$232,000 to restore pay costs absorbed in FY 1982.
- (b) A decrease of \$814,000 for Federal administration and staffing.

Need for Change. When Congress established the Department of Agriculture and the land-grant colleges in 1862, it created a Federal-State partnership in agricultural research to serve the people of every State and region. As a Federal partner, Cooperative State Research Service participates in a nationwide system of research program planning and coordination with a network of State agricultural experiment stations, land-grant colleges of 1890, schools of forestry, colleges of veterinary medicine and other cooperating institutions. Over the years the Federal staff has assumed a wide variety of roles in liaison, coordination and review of State and other institution research programs. The agency plans to review all these functions and determine which functions make the greatest contribution toward sustaining the Federal-State partnership.



Nature of Change. Administrative, technical and other responsibilities to coordinate the cooperative program of research and provide national leadership, as required by the many statutes and other legislative authorization, will be maintained. More specifically, the following functions will be continued but may be conducted in a different manner: (a) policy formulation and administration, (b) national/regional program planning activities, (c) program evaluation, approval and monitoring of formula funded activities, (d) operation of the Special Research Grants and Competitive Research Grants programs, (e) CSRS scientist representation at regional research technical committee meetings, (f) management of funding to the State institutions from other Federal agencies to support mutually beneficial programs, (g) attention to public inquiries, and (h) Current Research Information System publication of research inventories.

Since FY 1977, \$300,000 has been available within this limitation for State participation in pesticide impact assessment teams. With this decrease, State participation will be provided within funding for pesticide impact assessment under Special Research Grants.

- (8) An increase of \$8,800,000 for a facilities construction program at the 1890 Colleges and Tuskegee Institute (no funds available in FY 1982).

Need for Change. Section 1445 of P.L. 95-113 authorized continued Federal funding of the agricultural research programs carried out by the 16 land-grant colleges of 1890 and Tuskegee Institute. Existing facilities utilized for research at these institutions need to be renovated and improved to provide the conditions necessary to conduct top quality research. In addition, new facilities need to be constructed since either the existing ones are not adequate for the conduct of highly complex research, or the existing facilities do not contain adequate space for the current staff and space needs for their projected research programs. The institutions have had to encroach on the space of resident instruction and other campus programs in order to have the staff and programs authorized under current funding levels.

Nature of Change. The proposed funds would permit a grant program for facility construction at the campuses of the 1890 colleges and Tuskegee Institute. This program would provide funding for capital improvements including the major upgrading of existing facilities to meet adequate working conditions, to improve operating efficiency, and to meet new program requirements for food and agricultural research. This program would provide a research program commensurate with the role of these institutions in participating with 1862 institutions as partners to meet the needs of their States. One of the grant selection criteria would be the completeness of the schools' plans to integrate the new facilities into their overall, long-range institution plans. CSRS would monitor the schools comprehensive research plans to assure that the schools can fully utilize their new research capacity.



## COOPERATIVE STATE RESEARCH SERVICE

### STATUS OF PROGRAM

The funds appropriated for Cooperative State Research Service provide the Federal Government's support for land-grant agricultural experiment stations, approved schools of forestry, the 1890 land-grant institutions and Tuskegee Institute, Colleges of Veterinary Medicine and other eligible institutions in the various States and in Puerto Rico, Guam, the Virgin Islands, the District of Columbia, American Samoa, and Micronesia.

The State institutions conduct research and experiments on the problems continuously encountered in the development of a permanent and sustaining agriculture and forestry, and in the improvement of the economic and social welfare of rural and urban families. Because of differences in climate, soil, market outlets, and other local conditions, each State has distinct problems in the production and marketing of crops and livestock. Farmers, foresters, and rural people in the individual States naturally look to their State agricultural experiment stations, universities, and colleges for solution of the State and local problems and request services to help meet changing conditions.

Research programs at State institutions, to be most effective, include participation in regional and national programs. Joint effort by a group of State institutions is the most effective and often the only practical approach to problems of common interest. The stations are acting together as regional groups to provide cooperative coordinated attacks on problems of regional and national interest. In a similar manner, the research programs of the State institutions and the Department of Agriculture are complementary and interdependent.

The Federal formula funds constitute a powerful force in bringing about inter-State cooperation and Federal-State collaboration in the planning and conduct of this overall program of agricultural research. Therefore, the impact of the Federal formula funds cannot be fully evaluated solely on the basis of the amount of funds provided.

Research at the State institutions is organized into a program of projects that is submitted for approval by the Cooperative State Research Service. The program of projects is financed wholly or in part from Federal formula and grant funds. Programs and projects are evaluated periodically with station scientists by administrators and technical staff of the Cooperative State Research Service. The evaluation includes consideration of quality and productivity of the program and projects. The continuing process of research evaluation by station scientists and the staff of the Cooperative State Research Service results in a dynamic program with approximately 15 to 20 percent of the projects being replaced by new and/or revised projects each year.

Table 1  
Distribution of Federal Payments to States for Research at State Agricultural Experiment  
Stations and Other State Institutions - Fiscal Year 1981

State	Hatch Act, as amended		Coop. : Forestry : Research : (M-S)	1890 : Colleges & : Tuskegee : Institute	Special : Research : Grants	Competitive : Research : Grants	Animal : Health & : Disease : Research	Federal : Admin. : (Direct : Appro.)	Total : Federal : Funds
	Regular : Formula	Regional : Research							
Alabama.....	2,302,958:	604,498:	2,907,456:	348,571:	2,263,498:	223,280:	158,617:	...	5,901,422
Alaska.....	631,057:	102,613:	733,670:	164,766:	...	357,200:	11,589:	...	1,267,225
Arizona.....	854,195:	542,567:	1,396,762:	157,959:	...	635,530:	73,426:	...	2,383,677
Arkansas.....	1,957,190:	529,735:	2,486,925:	328,148:	979,303:	287,173:	91,359:	...	4,205,903
California.....	2,478,051:	1,175,516:	3,653,567:	355,378:	...	1,195,818:	392,794:	...	7,333,557
Colorado.....	1,133,913:	699,667:	1,833,580:	151,151:	...	496,601:	260,767:	...	3,072,099
Connecticut.....	973,330:	357,315:	1,330,645:	117,113:	...	155,338:	17,924:	...	1,851,020
Delaware.....	675,515:	270,304:	945,819:	62,653:	399,643:	65,923:	16,814:	...	1,590,852
District of Columbia.....	57,974:	25,610:	83,584:	...	...	...	...	...	83,584
Florida.....	1,566,163:	480,460:	2,046,623:	273,687:	759,807:	384,696:	114,603:	...	3,987,416
Georgia.....	2,520,488:	844,268:	3,364,756:	362,186:	1,218,807:	193,426:	186,480:	...	5,481,655
Guam.....	423,667:	80,256:	503,923:	...	...	5,000:	...	...	508,923
Hawaii.....	683,175:	274,394:	957,569:	83,076:	...	85,611:	9,156:	...	1,135,412
Idaho.....	1,053,538:	427,769:	1,481,307:	246,457:	...	573,161:	104,670:	...	2,550,595
Illinois.....	3,095,162:	723,243:	3,818,405:	198,804:	...	235,439:	200,150:	...	5,557,798
Indiana.....	2,808,526:	655,799:	3,464,325:	171,574:	...	552,051:	141,379:	...	5,082,329
Iowa.....	2,919,582:	951,006:	3,870,588:	103,498:	...	432,357:	368,753:	...	5,378,196
Kansas.....	1,825,548:	605,086:	2,430,634:	89,883:	...	390,073:	206,457:	...	3,219,147
Kentucky.....	2,890,856:	504,400:	3,494,400:	219,227:	1,330,891:	6,824:	109,265:	...	5,460,607
Louisiana.....	1,816,633:	461,926:	2,321,033:	321,340:	827,262:	219,066:	126,076:	...	3,904,777
Maine.....	945,803:	372,413:	1,318,216:	314,533:	...	5,785:	25,046:	...	1,663,580
Maryland.....	1,306,852:	468,591:	1,775,443:	144,344:	656,185:	100,824:	84,446:	...	3,415,242
Massachusetts.....	1,142,858:	457,408:	1,600,266:	130,729:	...	105,257:	49,790:	...	2,740,542
Michigan.....	2,860,177:	641,823:	3,502,000:	307,725:	...	795,268:	142,676:	...	5,453,469
Minnesota.....	2,767,863:	639,623:	3,407,486:	260,072:	...	554,957:	228,072:	...	4,690,587
Mississippi.....	2,412,317:	710,869:	3,123,186:	334,956:	948,666:	363,602:	81,045:	...	4,926,455
Missouri.....	2,685,538:	571,406:	3,256,944:	232,842:	1,229,100:	289,073:	187,691:	...	6,157,550
Montana.....	1,004,727:	479,075:	1,483,802:	212,419:	...	6,422:	111,624:	...	1,814,267
Nebraska.....	1,678,868:	648,425:	2,327,293:	69,461:	...	244,729:	203,947:	...	3,125,430
Nevada.....	620,110:	262,305:	882,415:	55,845:	...	5,000:	30,547:	...	973,807
New Hampshire.....	760,617:	263,058:	1,023,675:	178,382:	...	5,000:	16,206:	...	1,223,263
New Jersey.....	1,124,145:	716,785:	1,840,930:	123,921:	...	442,757:	32,008:	...	2,607,616
New Mexico.....	885,136:	288,600:	1,173,736:	137,536:	...	195,677:	50,407:	...	1,557,356
New York.....	2,792,276:	1,074,773:	3,867,049:	294,110:	...	1,000,160:	261,691:	...	6,637,610
North Carolina.....	3,832,089:	867,017:	4,699,106:	341,763:	1,676,847:	268,565:	126,026:	...	7,880,407
North Dakota.....	1,268,432:	430,572:	1,699,004:	49,038:	...	152,224:	69,565:	...	2,044,831
Ohio.....	3,380,570:	693,169:	4,073,739:	205,612:	...	630,829:	150,516:	...	5,732,696

State	Hatch Act, as amended			Coop.			1890			Special			Competitive:Health &			Animal			Federal			Total		
	Regular	Regional	Total	Forestry	Research	(M-S)	Colleges &	Tuskegee	Institute	Research	Grants	Grants	Research	Disease	Research	Grants	Research	Grants	Research	Grants	Research	Grants	Research	Grants
Oklahoma.....	1,755,279:	434,983:	2,190,262:	185,189:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:	372,155:
Oregon.....	1,310,654:	679,329:	1,989,983:	375,801:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pennsylvania.....	3,407,104:	879,188:	4,286,292:	266,880:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Puerto Rico.....	2,658,117:	538,631:	3,196,748:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rhode Island.....	628,302:	276,786:	905,088:	42,230:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
South Carolina.....	2,007,549:	499,151:	2,506,700:	280,495:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:	806,461:
South Dakota.....	1,294,783:	434,239:	1,729,022:	76,268:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tennessee.....	2,830,667:	618,941:	3,449,608:	239,650:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:	1,257,145:
Texas.....	3,587,699:	881,010:	4,468,709:	287,303:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:	1,665,256:
Utah.....	781,072:	494,467:	1,275,539:	110,305:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vermont.....	813,929:	234,855:	1,048,784:	191,997:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Virginia.....	2,429,082:	566,267:	2,995,349:	300,918:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:	1,152,755:
Virgin Islands.....	214,956:	70,576:	285,532:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Washington.....	1,496,993:	945,408:	2,442,401:	368,993:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
West Virginia.....	1,555,752:	390,306:	1,946,058:	226,035:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wisconsin.....	2,777,105:	762,094:	3,539,199:	253,265:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wyoming.....	729,522:	382,234:	1,111,756:	96,691:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
American Samoa.....	110,000:	...	110,000:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Micronesia.....	90,000:	...	90,000:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Other.....	...	114,658:	114,658:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Subtotal.....	94,614,464:	29,247,085:	123,861,549:	10,450,780:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:	18,064,015:
Committee of Nine.....	...	9,386:	9,386:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unobligated balance.....	578,764:	128,092:	706,856:	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Subtotal.....	95,193,228:	29,384,563:	124,577,791:	10,450,780:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:
Federal administration.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unobligated balance.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Subtotal.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Penalty Mail.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unobligated balance.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Subtotal.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
TOTAL.....	95,193,228:	29,384,563:	124,577,791:	10,450,780:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:	18,691,900:

TOTAL.....95,193,228:29,384,563:128,615,000:10,774,000:19,270,000:18,226,000:16,000,000:6,500,000:1,512,000:200,897,000



Table 2  
Available Funds for Cooperative State Research Service  
(In Dollars)

Program/State	Fiscal Year 1981 Actual	Fiscal Year 1982 Estimate	Fiscal Year 1983 Estimate
1. Payments under the Hatch Act:			
a. Distributed by formula:			
Alabama .....	2,302,958	2,471,586	2,522,530
Alaska .....	631,057	667,491	681,756
Arizona .....	854,195	913,937	934,771
Arkansas .....	1,957,190	2,108,050	2,153,905
California .....	2,478,051	2,686,597	2,747,358
Colorado .....	1,133,913	1,223,229	1,252,214
Connecticut .....	973,330	1,039,471	1,062,609
Delaware .....	675,515	717,660	733,439
District of Columbia .....	57,974	436,863	448,956
Florida .....	1,566,163	1,700,457	1,742,103
Georgia .....	2,520,488	2,717,838	2,777,244
Guam .....	423,667	573,814	587,032
Hawaii .....	683,175	721,318	735,900
Idaho .....	1,053,538	1,139,818	1,167,773
Illinois .....	3,095,162	3,383,104	3,467,144
Indiana .....	2,808,526	3,075,768	3,154,593
Iowa .....	2,919,582	3,200,669	3,282,581
Kansas .....	1,825,548	1,984,125	2,031,933
Kentucky .....	2,890,856	3,159,220	3,236,404
Louisiana .....	1,816,633	1,954,815	1,997,613
Maine .....	945,803	1,013,434	1,036,406
Maryland .....	1,306,852	1,400,361	1,430,846
Massachusetts .....	1,142,858	1,226,151	1,253,606
Michigan .....	2,860,177	3,127,614	3,207,294
Minnesota .....	2,767,863	3,034,096	3,112,212
Mississippi .....	2,412,317	2,589,054	2,641,859
Missouri .....	2,685,538	2,928,335	2,999,827
Montana .....	1,004,727	1,083,226	1,109,072
Nebraska .....	1,678,868	1,826,826	1,871,729
Nevada .....	620,110	657,820	672,402
New Hampshire .....	760,617	814,601	833,991
New Jersey .....	1,124,145	1,205,027	1,232,118
New Mexico .....	885,136	946,779	967,923
New York .....	2,792,276	3,027,791	3,098,440
North Carolina .....	3,832,089	4,155,906	4,250,513
North Dakota .....	1,268,432	1,371,677	1,404,173
Ohio .....	3,380,570	3,694,214	3,785,914
Oklahoma .....	1,755,279	1,900,624	1,944,969
Oregon .....	1,310,654	1,420,580	1,455,341
Pennsylvania .....	3,407,104	3,704,880	3,792,741
Puerto Rico .....	2,658,117	2,860,285	2,919,950
Rhode Island .....	628,302	664,935	679,051
South Carolina .....	2,007,549	2,152,081	2,196,309
South Dakota .....	1,294,783	1,403,403	1,437,484
Tennessee .....	2,830,667	3,071,382	3,142,169
Texas .....	3,587,699	3,910,664	4,004,210
Utah .....	781,072	831,703	849,785
Vermont .....	813,929	869,343	889,038
Virginia .....	2,429,082	2,623,471	2,681,560
Virgin Islands .....	214,956	560,299	573,599
Washington .....	1,496,993	1,623,207	1,662,537
West Virginia .....	1,555,752	1,671,460	1,707,429
Wisconsin .....	2,777,105	3,044,690	3,123,608
Wyoming .....	729,522	779,192	797,011
American Samoa .....	110,000	555,260	567,784
Micronesia .....	90,000	579,107	592,470
Subtotal .....	94,614,464	104,205,308	106,643,228
b. Regional research funds a/ .....	29,247,085	32,429,313	33,275,813
Committee of Nine .....	9,386	15,000	15,000
Total agricultural research under the Hatch Act .....	123,870,935	136,649,621	139,934,041
For administration .....	3,449,928	3,983,379	4,084,959
For penalty mail .....	421,023	476,000	476,000
Subtotal .....	127,741,886	141,109,000	144,495,000



Program/State	Fiscal Year 1981 Actual	Fiscal Year 1982 Estimate	Fiscal Year 1983 Estimate
2. Cooperative forestry research:			
Research program b/ .....	\$10,450,780	\$11,670,070	\$10,482,790
For administration .....	323,220	360,930	324,210
Subtotal .....	10,774,000	12,031,000	10,807,000
3. Payments to 1890 colleges & Tuskegee Inst.:			
Research program .....	18,064,015	20,847,240	21,023,780
For administration .....	578,100	644,760	650,220
Subtotal .....	18,642,115	21,492,000	21,674,000
4. Special research grants:			
Research program .....	17,679,220	22,446,770	21,986,020
For administration .....	546,780	694,230	679,980
Subtotal c/.....	18,226,000	23,141,000	22,666,000
5. Competitive research grants:			
Research program .....	15,520,000	15,830,400	22,193,600
For administration .....	480,000	489,600	686,400
Subtotal .....	16,000,000	16,320,000	22,880,000
6. Animal health and disease research:			
Research program .....	6,240,000	5,529,600	- -
For administration .....	260,000	230,400	- -
Subtotal .....	6,500,000	5,760,000	- -
7. Federal administration(direct appropriation):	1,498,877	1,363,000	781,000
8. 1890 Facilities:			
Research program.....	- -	- -	8,448,000
For administration.....	- -	- -	352,000
Subtotal.....	- -	- -	8,800,000
Unobligated balance .....	1,514,122	- -	- -
Subtotal, appropriated funds .....	200,897,000	221,216,000	232,103,000
Reimbursements .....	1,542,410	2,000,000	2,000,000
Allotment from:			
Forest Service .....	1,077,230	600,000	475,000
Total available or estimate .....	203,516,640	223,816,000	234,578,000

a/ Allotted to States on the basis of recommendation by a committee of experiment station directors and approved by Cooperative State Research Service.

b/ Apportioned among the States on a basis determined by the Secretary after consultation with a national advisory board of not less than seven officials of forestry schools selected by eligible institutions.

c/ In fiscal year 1981, includes \$500,000 for alcohol fuels research grants in accordance with section 1419 of Public Law 95-113, as amended, and \$650,000 for research authorized by the Native Latex Commercialization and Economic Development Act of 1978. In fiscal years 1982 and 1983, includes \$540,000 for alcohol fuels research and \$702,000 for research authorized by the Native Latex Act.

Table 3  
Available Funds for McIntire-Stennis Cooperative Forestry Research  
(In Dollars)

State	Fiscal Year 1981 Actual	Fiscal Year 1982 Estimate	Fiscal Year 1983 Estimate
Alabama.....	\$348,571	\$383,053	\$340,732
Alaska.....	164,766	207,680	186,088
Arizona.....	157,959	185,758	166,757
Arkansas.....	328,148	361,131	321,402
California.....	355,378	390,360	347,176
Colorado.....	151,151	163,837	147,427
Connecticut.....	117,113	127,301	115,209
Delaware.....	62,653	68,843	63,661
Florida.....	273,687	302,674	269,854
Georgia.....	362,186	397,667	353,620
Guam.....	-	-	-
Hawaii.....	83,076	98,072	89,435
Idaho.....	246,457	273,445	244,080
Illinois.....	198,804	200,372	179,645
Indiana.....	171,574	214,987	192,532
Iowa.....	103,498	119,994	108,766
Kansas.....	89,883	105,379	95,879
Kentucky.....	219,227	251,523	224,749
Louisiana.....	321,340	353,824	314,958
Maine.....	314,533	339,210	302,071
Maryland.....	144,344	171,144	153,870
Massachusetts.....	130,729	149,222	134,540
Michigan.....	307,725	346,517	308,515
Minnesota.....	260,072	288,059	256,967
Mississippi.....	334,956	368,439	327,845
Missouri.....	232,842	236,909	211,862
Montana.....	212,419	244,216	218,306
Nebraska.....	69,461	83,458	76,548
Nevada.....	55,845	76,150	70,105
New Hampshire.....	178,382	193,066	173,201
New Jersey.....	123,921	141,916	128,096
New Mexico.....	137,536	156,530	140,983
New York.....	294,110	324,595	289,184
North Carolina.....	341,763	375,746	334,289
North Dakota.....	49,038	61,536	57,218
Ohio.....	205,612	229,602	205,418
Oklahoma.....	185,189	200,373	179,644
Oregon.....	375,801	412,282	366,507
Pennsylvania.....	266,880	295,366	263,410
Puerto Rico.....	-	-	44,331
Rhode Island.....	42,230	54,229	50,774
South Carolina.....	280,495	309,981	276,297
South Dakota.....	76,268	90,765	82,992
Tennessee.....	239,650	266,138	237,636
Texas.....	287,303	317,288	282,741
Utah.....	110,306	134,608	121,653
Vermont.....	191,997	207,680	186,088
Virginia.....	300,918	331,902	295,628
Virgin Islands.....	-	-	-
Washington.....	368,993	404,975	360,063
West Virginia.....	226,035	258,830	231,193
Wisconsin.....	253,265	280,752	250,523
Wyoming.....	96,691	112,686	102,322
Subtotal.....	10,450,780	11,670,070	10,482,790
Federal administration (3%)....	323,220	360,930	324,210
TOTAL.....	<u>10,774,000</u>	<u>12,031,000</u>	<u>10,807,000</u>

Table 4

Payments to 1890 Colleges and Tuskegee Institute  
(In Dollars)

	<u>Fiscal Year 1981 Actual</u>	<u>Fiscal Year 1982 Estimate</u>	<u>Fiscal Year 1983 Estimate</u>
ALABAMA			
Alabama A&M University.....	\$1,141,587	\$1,256,965	\$1,266,277
Tuskegee Institute.....	1,121,911	1,237,289	1,246,601
ARKANSAS			
University of Arkansas at Pine Bluff	979,303	1,083,707	1,092,136
DELAWARE			
Delaware State College.....	399,643	433,427	436,155
FLORIDA			
Florida A&M University.....	759,807	852,410	859,887
GEORGIA			
Fort Valley State College.....	1,218,807	1,353,215	1,364,066
KENTUCKY			
Kentucky State University.....	1,330,891	1,509,786	1,524,230
LOUISIANA			
Southern University.....	827,262	995,265	1,003,029
MARYLAND			
University of Maryland- Eastern Shore.....	656,185	724,119	729,578
MISSISSIPPI			
Alcorn State University.....	948,666	1,307,540	1,317,285
MISSOURI			
Lincoln University.....	1,229,100	1,394,864	1,408,245
NORTH CAROLINA			
North Carolina A&T State University	1,676,847	1,956,892	1,974,442
OKLAHOMA			
Langston University.....	872,155	973,233	981,395
SOUTH CAROLINA			
South Carolina State College.....	806,461	1,091,155	1,099,170
TENNESSEE			
Tennessee State University.....	1,257,145	1,482,932	1,496,104
TEXAS			
Prairie View A&M College.....	1,665,256	1,880,435	1,897,817
VIRGINIA			
Virginia State College.....	1,152,755	1,284,806	1,295,463
CRIS.....	20,234	29,200	31,900
Subtotal.....	<u>18,064,015</u>	<u>20,847,240</u>	<u>21,023,780</u>
Unobligated balance .....	627,885	- -	- -
Federal administration (3%) .....	578,100	644,760	650,220
TOTAL.....	<u><u>19,270,000</u></u>	<u><u>21,492,000</u></u>	<u><u>21,674,000</u></u>

Table 5  
Grants for Agricultural Research  
Public Law 89-106  
(In dollars)

State	Fiscal Year 1981 Grants Awarded	
	Special Research Grants	Competitive Research Grants
Alabama.....	\$223,280	- -
Alaska.....	357,200	- -
Arizona.....	351,930	\$120,000
Arkansas.....	287,173	33,000
California.....	1,045,818	1,736,000
Colorado.....	496,601	330,000
Connecticut.....	155,338	230,000
Delaware.....	65,923	100,000
District of Columbia.....	- -	- -
Florida.....	384,696	408,000
Georgia.....	193,426	156,000
Guam.....	5,000	- -
Hawaii.....	85,611	- -
Idaho.....	563,161	145,000
Illinois.....	235,439	1,105,000
Indiana.....	472,051	753,000
Iowa.....	432,357	603,000
Kansas.....	390,073	102,100
Kentucky.....	6,824	300,000
Louisiana.....	219,066	90,000
Maine.....	5,785	- -
Maryland.....	100,824	654,000
Massachusetts.....	5,257	854,500
Michigan.....	795,268	705,800
Minnesota.....	554,957	240,000
Mississippi.....	263,602	75,000
Missouri.....	289,073	961,900
Montana.....	6,422	- -
Nebraska.....	244,729	280,000
Nevada.....	5,000	- -
New Hampshire.....	5,000	- -
New Jersey.....	345,757	168,000
New Mexico.....	125,677	- -
New York.....	902,160	1,214,600
North Carolina.....	268,565	768,100
North Dakota.....	152,224	75,000
Ohio.....	630,829	672,000
Oklahoma.....	8,595	170,000
Oregon.....	866,957	270,000
Pennsylvania.....	714,238	259,600
Puerto Rico.....	5,320	- -
Rhode Island.....	148,000	133,000
South Carolina.....	105,489	95,000
South Dakota.....	7,203	- -
Tennessee.....	38,100	103,000
Texas.....	2,006,081	272,000
Utah.....	155,030	50,000



<u>State</u>	<u>Fiscal Year 1981 Grants Awarded</u>	
	<u>Special Research Grants</u>	<u>Competitive Research Grants</u>
Vermont.....	\$5,000	\$90,000
Virginia.....	347,435	10,000
Virgin Islands.....	5,000	- -
Washington.....	856,550	247,000
West Virginia.....	5,000	- -
Wisconsin.....	462,698	940,400
Wyoming.....	154,928	- -
Subtotal.....	16,563,720	15,520,000
Federal administration (3%).....	512,280	480,000
TOTAL.....	<u>17,076,000</u>	<u>16,000,000</u>

Alcohol Fuels Research, Section 1419, P.L. 95-113

Idaho.....	\$10,000
Indiana.....	80,000
Massachusetts .....	100,000
Mississippi.....	100,000
New Jersey.....	97,000
New York.....	98,000
Subtotal.....	485,000
Federal administration (3%).....	15,000
TOTAL.....	<u>500,000</u>

Native Latex Commercialization and Economic Development Act of 1978

Arizona.....	\$283,600
California.....	150,000
New Mexico.....	70,000
Texas.....	126,900
Subtotal.....	630,500
Federal administration (3%).....	19,500
TOTAL.....	<u>650,000</u>

Table 6  
Animal Health and Disease Research  
Section 1433, P. L. 95-113  
(In Dollars)

<u>State/Recipient</u>	<u>Fiscal Year 1981 Actual</u>	<u>Fiscal Year 1982 Est.</u>
<u>ALABAMA</u>		
Agricultural Experiment Station, Auburn University .....	\$108,063	\$89,645
School of Veterinary Medicine, Auburn University .....	23,668	21,560
School of Veterinary Medicine, Tuskegee Institute .....	26,886	20,435
<u>ALASKA</u>		
Agricultural Experiment Station, University of Alaska .....	11,589	12,503
<u>ARIZONA</u>		
Agricultural Experiment Station, University of Arizona .....	73,426	60,007
<u>ARKANSAS</u>		
Agricultural Experiment Station, University of Arkansas .....	91,359	81,957
<u>CALIFORNIA</u>		
Agricultural Experiment Station, Univ. of California, Berkeley	232,257	203,790
School of Veterinary Medicine, University of California, Davis	160,537	177,166
<u>COLORADO</u>		
Agricultural Experiment Station and College of Veterinary Medicine, Colorado State University .....	260,767	276,285
<u>CONNECTICUT</u>		
Agricultural Experiment Station, Univ. of Connecticut, Storrs.	17,924	20,041
<u>DELAWARE</u>		
Agricultural Experiment Station, University of Delaware .....	16,814	17,041
<u>FLORIDA</u>		
Agricultural Experiment Station, University of Florida .....	98,792	82,307
College of Veterinary Medicine, University of Florida .....	15,811	15,821
<u>GEORGIA</u>		
Agricultural Experiment Station, University of Georgia .....	49,398	40,281
College of Veterinary Medicine, University of Georgia .....	137,082	124,516
<u>HAWAII</u>		
Agricultural Experiment Station, University of Hawaii .....	9,156	8,341
<u>IDAHO</u>		
Agricultural Experiment Station and College of Veterinary Medicine, University of Idaho .....	104,670	85,447
<u>ILLINOIS</u>		
Agricultural Experiment Station and College of Veterinary Medicine, University of Illinois .....	200,150	167,905
<u>INDIANA</u>		
Agricultural Experiment Station and School of Veterinary Medicine, Purdue University .....	141,379	120,908
<u>IOWA</u>		
Agriculture & Home Economics Experiment Station, Iowa State Univ.	42,338	51,691
College of Veterinary Medicine, Iowa State University .....	326,415	280,350
<u>KANSAS</u>		
Agricultural Experiment Station and College of Veterinary Medicine, Kansas State University .....	206,457	185,103
<u>KENTUCKY</u>		
Agricultural Experiment Station, University of Kentucky .....	109,265	93,303
<u>LOUISIANA</u>		
Agricultural Experiment Station, Louisiana State University ..	110,564	94,090
College of Veterinary Medicine, Louisiana State University ...	15,512	17,501
<u>MAINE</u>		
Agricultural Experiment Station, University of Maine .....	25,046	24,622
<u>MARYLAND</u>		
Agricultural Experiment Station, University of Maryland .....	68,862	63,078
John Hopkins University .....	15,584	2,347
<u>MASSACHUSETTS</u>		
Agricultural Experiment Station, University of Massachusetts .	21,738	16,945
School of Veterinary Medicine, Tufts University .....	28,052	36,068
<u>MICHIGAN</u>		
Agricultural Experiment Station, Michigan State University ...	91,310	68,783
College of Veterinary Medicine, Michigan State University ....	51,366	47,294
<u>MINNESOTA</u>		
Agricultural Experiment Station, University of Minnesota .....	84,055	76,364
College of Veterinary Medicine, University of Minnesota .....	144,017	124,668
<u>MISSISSIPPI</u>		
Agricultural and Forestry Experiment Station and College of Veterinary Medicine, Mississippi State University .....	81,045	76,879

<u>State/Recipient</u>	<u>Fiscal Year 1981 Actual</u>	<u>Fiscal Year 1982 Est.</u>
MISSOURI		
Agricultural Experiment Station, University of Missouri .....	\$66,293	\$45,869
College of Veterinary Medicine, University of Missouri .....	121,398	123,728
MONTANA		
Agricultural Experiment Station, Montana State University .....	111,624	89,650
NEBRASKA		
Agricultural Experiment Station, University of Nebraska .....	203,947	184,801
NEVADA		
Agricultural Experiment Station, University of Nevada .....	30,547	23,947
NEW HAMPSHIRE		
Agricultural Experiment Station, University of New Hampshire ..	16,206	12,753
NEW JERSEY		
Agricultural Experiment Station, Rutgers University .....	32,008	27,466
NEW MEXICO		
Agricultural Experiment Station, New Mexico State University ..	50,407	43,831
NEW YORK		
Agricultural Experiment Station, Cornell University .....	38,475	43,554
College of Veterinary Medicine, Cornell University .....	223,216	188,889
NORTH CAROLINA		
Agricultural Experiment Station and College of Veterinary Medicine, North Carolina State University .....	126,026	101,339
NORTH DAKOTA		
Agricultural Experiment Station, North Dakota State University	69,565	57,879
OHIO		
Ohio Agricultural Research and Dev. Center, Ohio State Univ. ..	89,550	65,621
College of Veterinary Medicine, Ohio State University .....	60,966	69,974
OKLAHOMA		
Agricultural Experiment Station, Oklahoma State University ....	157,722	( 130,813
College of Veterinary Medicine, Oklahoma State University .....	5,066	)
OREGON		
Agricultural Experiment Station, Oregon State University .....	66,998	63,963
School of Veterinary Medicine, Oregon State University .....	59,214	50,978
PENNSYLVANIA		
Agricultural Experiment Station, Pennsylvania State Univ. ....	64,985	55,225
School of Veterinary Medicine, University of Pennsylvania .....	97,406	105,426
PUERTO RICO		
Agricultural Experiment Station, University of Puerto Rico ....	16,935	16,008
RHODE ISLAND		
Agricultural Experiment Station, University of Rhode Island ...	15,231	12,658
SOUTH CAROLINA		
Agricultural Experiment Station, Clemson University .....	28,397	23,241
SOUTH DAKOTA		
Agricultural Experiment Station, South Dakota State University.	125,871	109,615
TENNESSEE		
Agricultural Experiment Station and College of Veterinary Medicine, University of Tennessee .....	82,137	73,990
TEXAS		
Agricultural Experiment Station and College of Veterinary Medicine, A&M University .....	436,027	343,157
UTAH		
Agricultural Experiment Station, Utah State University .....	60,889	61,031
VERMONT		
Agricultural Experiment Station, University of Vermont .....	19,674	17,148
VIRGINIA		
Agricultural Experiment Station and College of Veterinary Medicine, Virginia Polytechnic Institute and State Univ. ....	95,619	86,636
WASHINGTON		
Agricultural Experiment Station, Washington State Univ. ....	35,524	28,038
College of Veterinary Medicine, Washington State Univ. ....	115,483	110,128
WEST VIRGINIA		
Agricultural & Forestry Experiment Station, West Virginia Univ.	23,531	18,317
WISCONSIN		
Agricultural Experiment Station, University of Wisconsin .....	239,723	215,841
WYOMING		
Agricultural Experiment Station, University of Wyoming .....	51,986	43,044
Subtotal .....	6,240,000	5,529,600
Federal administration .....	260,000	230,400
Total .....	<u>6,500,000</u>	<u>5,760,000</u>



## PAYMENTS UNDER THE HATCH ACT

The Hatch program of research at the State agricultural experiment stations is aimed at improving rural living conditions, conserving resources, and promoting efficient production, marketing, distribution, and utilization of crops and livestock essential to the food supply or health and welfare of the people of the United States.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

### 1. NATURAL RESOURCES

Current activities: 11 percent of total Hatch funds for research. Included are soil and land use, water and watersheds, outdoor recreation, environmental quality, fish and wildlife, and remote sensing.

#### Selected examples of recent progress:

Strip Mine Reclamation Research Provides Philadelphia with Solution to Sludge Disposal Problem. For 40 years Philadelphia dumped its sludge into the ocean. This year, however, most of the city's 70,000 dry tons of sludge is going to rural Somerset County to make badly scarred and barren strip mine land productive again. In 1978, the Environmental Protection Agency gave Philadelphia until December 31, 1980, to stop ocean-dumping of sludge. City officials turned to the Pennsylvania Agricultural Experiment Station for assistance. The School of Forest Resources had been conducting research on the feasibility of using municipal sludge for mined land reclamation. The results of research had shown that the concept was technically sound and environmentally safe.

The knowledge gained from those experiments was used to assist Philadelphia in establishing several test plots in the bituminous coal mining region of western Pennsylvania for the purpose of demonstrating the concept to the public and to gain local support. All demonstration projects were highly successful and the program was quickly expanded into a full-scale operation. The program which started with a 10-acre plot in 1978 is now using treated Philadelphia sludge to help revegetate 1,000 acres annually.

Soil Testing Leads to Greater Fertilizer Efficiency. The calibration of soil tests for nitrogen and the validation of soil test recommendations at the Nebraska Agricultural Experiment Station offers corn producers a practical way to manage for greater fertilizer use efficiency. Use of the nitrate-nitrogen test of deep soil samples is estimated to save corn growers a potential of \$7.2 million annually in nitrogen fertilizer costs, with an associated savings of some 1.1 billion cubic feet of natural gas that would be required for manufacture of the fertilizer. Based on sound research, production practices for the most effective use of fertilizer nitrogen have been developed. Nitrogen fertilizer is a costly and energy-demanding production input; however its use should receive major credit for the doubling of average corn-grain yields in the past 20 years. In addition to improving efficiency of fertilizer use, the research has shown that no deleterious environmental impact from fertilizers will result where these recommended practices are followed.

Chromium May Become Toxic in Soils. Scientists and federal authorities have not considered moderate levels of chromium pollution to be an important health threat because chromium has been assumed to end up in soils in its insoluble reduced form. However, recent work at the Agricultural Experiment Station in Vermont has shown chromium to be spontaneously and rapidly oxidized to its toxic and mobile form in many soils. The key to chromium oxidation in soil was found through research to be manganese oxides which



became reduced as the chromium was oxidized. The Vermont station is concentrating on research of the behavior of chromium in soils as part of the Northeast NE-96 Regional project on the fate of potentially toxic heavy metals in soils.

Measurement of Gaseous Nitrogen Losses From Soil. Efficiency of fertilizer nitrogen and the fate of nitrogen in the soil has been the subject of ongoing research by the Illinois Agricultural Experiment Station. Perhaps half of the fertilizer nitrogen applied to the soil is never found in the crop. Some is leached from the soil and some is converted to gases by micro-organisms through the denitrification process. Research effort has been directed toward developing a routine procedure to measure denitrification as it occurs at specific sites throughout the year. Analysis of results to date indicates that denitrification takes place largely in the surface soil. It occurs in bursts after rains and is more pronounced in the poorly drained soils. From these results and subsequent research, it may be possible to predict the occurrence of denitrification by taking into account soil characteristics along with rainfall and soluble carbon supply.

Electrostatic Sprayer. Georgia State Agricultural Experiment Station agricultural engineers have developed a sprayer in which very small spray droplets are given a negative electrical charge. Because the ground is positively charged, the droplets are attracted to the leaves of crops, literally enveloping them with spray. Insecticide applied to cotton at 50 percent the recommended rate provided as good control as conventionally applied insecticides. Laboratory tracer studies have documented a four-fold increase over conventional spraying in deposition onto field corn plants. Pre-commercial models of three sprayer types are being field tested. If widely used, the electrostatic sprayer could significantly reduce the quantities of chemicals put into the environment and could give large savings to farmers who must buy costly pesticides.

Peanut Oil as Fuel. Georgia State Agricultural Experiment Station engineers are running two campus buses on various mixtures of peanut oil and petroleum to determine the long-term effects of using peanut oil to run diesel engines. A tractor is also being fueled by 100 percent peanut oil. To date there have been no serious problems with using peanut oil as a diesel fuel. At present peanut oil is more costly than petroleum, but rising petroleum costs and turmoil in the Middle East could change that. With a simple press and a filter, farmers could produce their own tractor fuel if it became necessary or economical.

## 2. FORESTRY RESOURCES

Current activities: 2 percent of total Hatch funds for research. Forestry related research under Hatch is closely coordinated with the McIntire-Stennis Cooperative Forestry Research program which has similar research objectives. The Hatch forestry research program is characterized by a higher degree of multi-institutional or regional projects.

### Selected examples of recent progress:

Method to Evaluate Water Use by Plants Developed. A University of Arizona hydrologist in the School of Renewable Natural Resources has developed and field tested a portable energy budget system of unequalled precision for evaluating water consumption of riparian plant communities in Arizona. These data are vital as a basis for decisions on alternatives for the management of riparian communities for water conservation, wildlife habitat and aesthetic purposes. The precision of hourly and daily evapotranspiration estimates with this energy budget system has been about 2 percent at the riparian site. This precision is substantially better than

the 20 to 25 percent value that is normally applied to evapotranspiration estimates from either the energy budget or the water budget methods. The higher precision is due partly to a new psychrometer design and partly to the use of a small computer to control sampling and provide real-time analysis. The system permits precise evaluation of water use under natural, undisturbed conditions in the field, and it has proven useful in studying the water use of irrigated fields as well as riparian and other wildland plant communities.

Biomass Offers Energy Alternative for Agriculture in Hawaii. Hawaii has the potential to replace 1,580,500 barrels of imported oil by burning biomass crops for electricity generation according to a study carried out at the State Agricultural Experiment Station. Findings from the study show that the contribution of biomass crops (based on existing acreages) to Hawaii's utility grid could account for 10.61 percent of the projected 1985 electric power requirements of the State. This is the equivalent of 1,580,500 barrels of residual fuel oil and its value in current dollars is approximately \$54.5 million. The most cost-effective and technologically-sensible conversion of Hawaii's biomass sources to electricity can be best accomplished by a central power plant, as opposed to small, widely-scattered plants operated by individual plantations; and the generation of one kwh of electricity from a biomass-fueled plant is estimated to result in a considerable saving in fuel costs. The findings emerging from this study provide strong evidence that Hawaii's biomass crops constitute an economically feasible, operationally viable and environmentally safe alternate energy source for the State.

Method Developed to Convert Biomass to Edible Sugar and Alcohol. Basic research was carried out at the Virginia State Agricultural Experiment Station on the conversion of cellulosic waste material to edible sugar that could be fermented to alcohol. The basic research has resulted in the development of a commercial process. This process is now the basis for planning the construction of a new \$100 million dollar/year industry in Petersburg, Virginia to produce 50 million gallons of ethanol/year which projects the ultimate hiring of 400 people, the production of \$2.4 million dollars/year in taxes, and savings of \$400,000/year in landfill maintenance costs.

Acid Precipitation Influences Stream pH and Acidity. Acid precipitation is a worldwide environmental problem. In the Northeastern United States, the acids in rainfall have already caused measurable damage to numerous lake ecosystems, and the continued intensification of acidic precipitation may result in long-term damage to forest ecosystems. Scientists from the School of Forest Resources at Pennsylvania State University are studying the influence of acidic precipitation on the water quality of small headwater streams. Samples of streamwater draining the three Leading Ridge Experimental Watersheds are collected during rainfall events. These stormflow samples are evaluated for fluctuations in pH, acidity and alkalinity. Significant reductions in stream alkalinity, along with corresponding increases in acidity, correlate well with the lowering of pH values during a period of several hours of rainfall. These changes which take place in streamwater quality during a stormflow period attributable to acid precipitation seem likely to cause a great deal of stress to the aquatic organisms which inhabit affected freshwater streams. The studies show that acidification of the atmosphere can result in changes in riparian vegetation thus changing ecosystems and water quality in small watersheds.

### 3. CROPS RESOURCES

Current activities: 39 percent of total Hatch funds for research. Included under the research program are crop protecting and production systems for dependable and efficient production, quality improvement, quality



maintenance, product development, and related commodity aspects of marketing of crops.

Selected examples of recent progress:

Perennial Farm and Rangeland Weeds Controlled. The economic impact of livestock poisoning by plants in the State of Wyoming is enormous. Wyoming Experiment Station scientists estimate that Geyer larkspur alone costs the Wyoming cattlemen over \$9 million annually. A chemical control program developed for Wyoming has alleviated much of the problem. Larkspur is being controlled, livestock losses reduced, the range production increased by an average of 300 percent, and cattle come off the range 30 to 40 pounds heavier. Many other range improvement programs through effective control of snakeweed, sagebrush, locoweeds, and pricklypear have been documented. Weed control in sugar beets has reduced the hand labor requirement from over 30 hours per acre to a low of 2.2 hours per acre.

Tracy-M---A New Soybean Variety. Cooperative research of weed scientists and agronomists at the Delta Branch, Mississippi Agricultural and Forestry Experiment Station and S&E/ARS, Stoneville, Mississippi have developed and released 'Tracy-M' soybean variety which is tolerant to the herbicide metribuzin. Tracy-M was selected from the 'Tracy' variety which is highly sensitive to metribuzin. Tracy was released in 1974 and ranked as the top yielding variety on clay soil at three locations in Mississippi as compared to 'Forrest', 'Davis', and 'Bragg' over a nine-year period. Tracy is also more tolerant to the herbicide, 2,4-DB than other currently grown varieties and has a broad range of resistance to phytophthora rot. Tracy-M offers the grower a variety which will tolerate suggested use rates of metribuzin while maintaining the high yield, 2,4-DB tolerance, and phytophthora rot resistant traits of Tracy. Metribuzin is the most effective preemergence soybean herbicide available for controlling hemp sesbania, prickly sida, and sicklepod. Tracy could be grown on approximately 1.5 million acres of silty clay to clay soils in the Mississippi Delta, but it is sensitive to metribuzin which is needed for optimum weed control. Tracy-M can bypass this shortcoming. In addition, sicklepod is spreading rapidly in the State from the southeastern to the northeastern counties and metribuzin is the most effective preemergence herbicide on this weed. Tracy-M could well fit in with the sicklepod control programs.

Herbicide Detoxifying Enzyme Discovered. Research at the New Jersey Agricultural Experiment Station has, after many years of effort, succeeded in purifying and partially characterizing the key enzyme in metabolism of the herbicide propanil in rice plants. The enzyme detoxifies the herbicide as it enters the cells of rice plants but it is not active in pest weeds. Researchers have determined the intracellular location of the enzyme and now have for the first time purified it to homogeneity. Knowledge of this enzyme and its characteristics in other plants allows us now to predict which crop plants are best suited for the use of herbicides similar to propanil, that is, researchers should be able to match the crop to the herbicide through studies of enzyme activity. Further, such purifications and characterizations must precede any attempt, by genetic engineering, to add specific pesticide resistance to the cells of critically important crop plants.

Controlling Insects and Mites of Apples. A long-term research effort at the Washington State Agricultural Experiment Station has led to the development and industry-wide utilization of an integrated pest management program which is worth at least \$10 million annually to Washington apple growers. This program reduces the amount and cost of pesticides required, it reduces the number of spray applications, and it maintains or enhances fruit finish and quality required for fresh apple marketing.

Washington has about 100,000 acres of bearing apple orchards. Integrated pest management developed from this research is utilized on at least 80 percent of that acreage. The saving in pesticide use and application costs amounts to about \$70 per acre or an annual saving to the industry of \$5,600,000. In addition, integrated control has increased the percentage of higher grade fruit and the final income to the growers. Depending on severity of the pest problems, fruit grades have increased from 1 to 12 percent with a coordinate increase of approximately \$1.00 to \$1.50 per box increased return for the improved grades. As a result of better fruit grade the increased crop value could range from \$10 to \$120 per acre with a total industry value of \$800,000 to \$9,600,000.

Dwarf Fruit and Nut Trees. Plant geneticists at the California Agricultural Experiment Station at Davis have discovered a mutant gene that permits dwarfing the size of peach trees, but which does not diminish their production of fruit. Planted at a density of 10 times that of standard trees, the dwarf trees produce 15 to 22 tons of fruit per acre, compared to an average of 3 tons for standard varieties. The scientists believe the same technology can be applied to almonds, which are closely related to peaches, reducing the acreage of prime California agricultural land now devoted to this crop by 270,000 to 300,000 acres.

Drought Resistance in Alfalfa. A shortage of irrigation water is one of the primary limiting factors to alfalfa production in the western U.S. The competition to agriculture from urban and industrial users for water is expected to increase in the future. Researchers at the New Mexico Agricultural Experiment Station have developed plant breeding procedures which have resulted in improved alfalfa populations capable of yielding as much forage as the check cultivars with approximately 40 percent less irrigation water. This will allow maintenance or expansion of alfalfa acreage in moisture stressed areas, and reduced costs for production. The findings could be applicable to other alfalfa growing areas affected by periods of moisture stress and to other crops.

Plant Breeders Keep Up With New Greenbugs. When a new type of greenbug evolved in the summer of 1980 and began attacking all known varieties of sorghum, Oklahoma Agricultural Experiment Station agronomists were already well along with an answer to the problem. By early fall, they had released 12 germplasm lines resistant to the new biotype and four more with partial resistance. The speed with which the new breeding material was made available was due to ongoing research in sorghum breeding. Known as "bloomless sorghums", the new lines are especially significant as they are resistant, not just tolerant, to the new greenbug. This step in the ongoing research program put researchers years ahead of where they otherwise would have been in solving the problem. Greenbugs cost Oklahoma producers an estimated \$5.4 million annually.

Perennial Red Clover Through Hybridization. Livestock producers in the south central United States will benefit from basic tissue and cell culture research at the Kentucky Agricultural Experiment Station that has resulted in the first successful hybridization of a wild perennial Trifolium species with red clover. The objective of the research is to transfer genes for the perennial trait into red clover since currently available red clover varieties stay in pasture and hay stands for only two to three years. Scientists have tried without success for over twenty five years to obtain hybrids of red clover with perennial species. The present breakthrough was possible because a tissue culture system was developed for red clover by the Kentucky research team and a hybrid embryo rescue technique was utilized to grow the hybrids which otherwise would have died. The germplasm is now available for breeding long-lived red clover varieties.



Meadow Orchard Peach Cultivation Practice to Increase Income. A complex group of peach disorders, commonly called "peach decline", plus the rising costs of hand harvesting, have been the principal contributors to a steady decline in Georgia peach production. Georgia State Agricultural Experiment Station horticulturists have developed a Meadow Orchard system that appears to eliminate both problems. Rooted peach cuttings are planted. The second year they bear a crop. After harvest the plants are cut to a stump, from which sprouts develop. The sprouts produce a crop the next year. With close plantings meadow orchards produce crops at least as large per acre as standard orchards. Because the plants never become mature trees, they can be harvested mechanically or easily by hand, and peach decline appears to be eliminated.

Corn Cyst Nematode Discovered in Maryland. The corn cyst nematode (*Heterodera zeae*) was discovered for the first time in the United States in February 1981 by a scientist from the Maryland Agricultural Experiment Station. The easy transmissibility of this pest and the fact that such transmission could reduce corn yield by as much as 15 percent are the reasons for a major research and containment program involving the Maryland Agricultural Experiment Station and the USDA at the infested site in Maryland. Major activities for 1981 included research on the extent of spread of the nematode, confirmation of presence in the discovery area, sources of resistance in corn lines and physiology of the infection process. The pest is an immediate threat to the corn crop of the Delmarva Peninsula and the local broiler and livestock industries which use corn as a major feed base.

#### 4. ANIMAL RESOURCES

Current activities: 29 percent of total Hatch funds for research. Included under this research program grouping are protection, production and management aspects of beef and dairy cattle, swine, sheep, other animals, poultry, and aquaculture. It also includes quality improvement, product development, and related commodity aspects of marketing.

##### Selected examples of recent progress:

Maximizing Forage in Production of Beef. At the Nebraska Agricultural Experiment Station alternative uses for domestic corn production, including increased exports, fructose production, numerous types of biomaterials, and ethanol production, are beginning to decrease the supply of corn available for beef production. This decrease in supply will result in an increase in the cost of beef production. However, where corn is produced, the forage residue is available for grazing or harvest and is a relatively low cost feed source. A forage system which maximizes use of forage residue and minimizes use of corn grain has been evaluated. Cornstalks are grazed 56 days, stalkage fed 121 days, pastures grazed 112 days, and corn grain fed 96 days. With this system, over 65 percent of the heifers graded Choice and used one-half the amount of corn that would have been used in a typical corn-corn silage system. This accounted for a reduction of approximately 1,500 pounds of corn/animal finished. Additionally, the use of hydroxide treatment increased the digestibility of the harvested residue. The use of bypass proteins cut protein supplement cost.

Vaccines to Prevent Sheep Foot Rot. Prevention of ovine foot rot through immunization is one step nearer because of research at the Oregon State Agricultural Experiment Station. In the past, vaccines have been developed, marketed and used for ovine foot rot but none of these have proven reliable and the commercial vaccines have been discontinued. Researchers have now developed reliable culturing and typing techniques which show that the causal agent Bacteroides nodosus of ovine foot rot occurs in at least 12

antigenic forms and that immunity against one type does not confer immunity to all others. This explains one major reason for the past vaccine failures and offers a possibility for developing a new effective polyvalent or broadly antigenic vaccine. Ovine foot rot is a major continuing disease problem in all the sheep-producing areas and the cost of labor and materials alone for managing foot rot in infected flocks will exceed \$5.00 per sheep per year.

Prevention of Calf Scours. Scours, caused by enteropathogenic *Escherichia coli* (EEC) and estimated to cause the death of 500,000 calves annually in the United States, has been effectively reduced by a vaccine developed at the Montana State Agricultural Experiment Station. The vaccine will reduce losses associated with spontaneous diarrheal disease (scours) caused by EEC in young calves.

The vaccine, which is administered to pregnant cows, acts by stimulating an elevated level of colostral antibodies against the important surface antigens (K30, K35, K85, K99) of EEC. The calf is passively immunized via colostral antibodies during the first week of life when its susceptibility to infection with EEC is greatest. Results have been good following use of the vaccine during the 1981 spring calving season.

Acceptability of Forage Versus Forage Grain Fed Beef. Researchers at the Tennessee State Agricultural Experiment Station found grain feeding of slaughter cattle could be reduced 10 to 70 days without losing desirable carcass and palatability characteristics. Fat composition rather than amount of fat was closely related to undesirable flavor of beef from cattle, backgrounded on fescue pasture. Results from grain feeding (shelled corn plus protein supplement) cattle 28, 56, 84, 112 or 140 days showed greatest flavor improvement the first 56 days and little improvement after 84 days. Grass-fed beef contained levels of linolenic acid that cause undesirable flavors in other foods. Linolenic acid levels decreased linearly with time on grain. Concentrations of other fatty acids also changed with time on grain.

Added Buffers Improve Milk Production. According to Pennsylvania State Agricultural Experiment Station scientists increasing numbers of dairy herdsmen are managing and feeding cows in groups. Under this management system, cows are rapidly changed from high fiber diets precalving to low fiber (high energy) diets postcalving, and maintained on these diets throughout lactation. Studies at the Pennsylvania State University have shown that the addition of a buffer such as sodium bicarbonate to high energy diets facilitates adaptation by cows to the diets after calving. Cows fed diets with added buffers consumed 9 percent more feed and produced 10 percent more milk than cows fed unbuffered diets. Since peak milk production postcalving determines milk yield for the entire lactation, the addition of buffers to diets in early lactation may provide a method to enhance feed intake and milk yield and improve the dollar return per unit of feed. In a recently completed full lactation study in which three other universities cooperated, the improved milk yield with added buffers persisted for the entire 10-month lactation period.

Double-cropping Crawfish and Rice is Profitable and Efficient. Researchers at Louisiana State Agricultural Experiment Station, double-cropping rice and crawfish on the same land in the same year, used rice field waste after harvest to feed crawfish in the winter and spring to produce as much as 1,500 pounds of the crustacean per acre. Farmers, who received an average of 80 cents a pound for crawfish last year, might expect to raise as much as 1,000 pounds per acre. In addition, because rice was seeded broadcast on land vacated by crawfish the second year of the study, traditional machine soil preparation was unnecessary, thus reducing fuel consumption by about 30 percent. Because water stood on the land nearly the year around and because



crawfish eat nearly any plant material, weeds and grasses were under control, thus reducing the need for herbicides. Also, because rice levies were kept up the year around, there was no soil erosion and virtually no loss of water, since rains supplied enough both for crawfish and for the early rice season.

Nutrient Interrelationships Affecting Performance and Body Composition of Swine. Research at the South Dakota State Agricultural Experiment Station has shown that pigs can be fed protein-limited diets during early growth and completely compensate for the resulting decrease in gain because of an increase in gain during the subsequent finishing period. Pigs of an initial weight of 55-60 pounds could be fed a diet of 14 percent protein to market weight without detrimental effect on gain, feed efficiency, or carcass quality and save approximately \$1.48 per head in feed costs due to feeding less protein supplement during the first four-week period when a 16 percent protein diet previously has been recommended. This practice has the potential of saving South Dakota swine producers \$4,440,000 annually.

Poultry By-product (Offal) Meal in Broiler Diets. Research at the Georgia Agricultural Experiment Station has shown that a drug which is commonly used and highly effective for controlling coccidiosis in broilers, depresses growth when the diet contains animal protein from a mixture of fish meal, poultry by-product meal, and meat and bone scraps. The depression can be controlled in part by supplementing the diet with potassium or sodium chloride. Subsequent trials indicate that fish meal alone causes the problem but the effect of poultry by-product meal as the sole source of animal protein remains to be explored. If poultry by-product meal contributes to the problem, research in this area is critical since there are few other means of disposing of poultry offal that do not have environmental quality implications.

Sunflower Oil Meal as a Protein Supplement in Livestock Rations. Research at the North Dakota State Agricultural Experiment Station indicates that sunflower oil meal will substitute for soybean oil meal in finishing rations for lambs and cattle on a protein equivalent basis. Research has indicated that sunflower oil meal is deficient in lysine for non-ruminant animals. When sufficient lysine is added to a sunflower oil meal ration, swine gains have been equal to gains of swine fed soybean oil meal rations. Replacing over two-thirds of the soybean oil meal in barley rations has resulted in a decrease in feed efficiency. Research also indicates that sunflower oil meal rations supplemented with lysine are equivalent to soybean oil meal rations for turkey growth but resulted in decreased feed efficiencies. Sunflower oil meal was equal to soybean oil meal in rations for high producing dairy cows when substituted on a protein basis.

## 5. PEOPLE, COMMUNITIES, AND INSTITUTIONS

Current activities: Equal to 12 percent of total Hatch funds for research. Included under this research program grouping are food and nutrition, food safety, rural development, and families and consumers.

### Selected examples of recent progress:

Water for Rural Communities. Sociologists at Cornell University are carrying on the first national study of the quality, quantity, reliability and cost of household water in rural areas. The analysis has measured the characteristics of water supplies, water providers and water users in rural areas. The results are particularly important during a time when a growing rural population and a revitalized rural economy are placing increased demands on water supplies. At the same time, rural water systems are aging and water supplies are diminishing. The results are being used by policy

makers and planners in adjusting to current rural development trends and in preparing for future population growth and change in rural areas.

Energy Conservation in Western Homes. Social scientists in 10 Western States and Pennsylvania are cooperating in a Hatch Act supported regional research project (W-159) concerned with household energy conservation policies. The study has demonstrated that residents of western states prefer a combination of conservation and production to cope with our declining energy supply. If conservation decisions need to be made to help reduce energy dependence on other nations, reduction of energy use in homes is preferred over reduction of energy use in the transportation and production sectors of the economy. However, they also feel that energy conservation should be a matter for individual householders' decisions and not mandates from federal programs. The information obtained from this project should help in making decisions on energy policies since it identifies energy conservation techniques that can easily be adopted by households.

Dairy Product Consumption and Atherosclerosis Risk. Many Americans are trying to reduce their consumption of saturated fat and cholesterol in order to reduce their risk of developing atherosclerosis. Because milk and other dairy products contain cholesterol and saturated fat, per capita consumption of dairy products has been decreasing. However, in a study at Washington State University, healthy human volunteers who increased their consumption of lowfat (2 percent) or nonfat milk by four glasses daily or who ate two cartons of lowfat yogurt daily showed no change in total serum cholesterol after three or four weeks. Since serum cholesterol is found in two forms, low density lipoproteins (associated with increased risk), and high density lipoproteins (associated with decreased risk), the most accurate predictor of risk is the ratio of these forms. Investigators at the Washington State Agricultural Experiment Station have also shown that by modifying the milk sugar content of dairy products fed to rats, the proportion of high to low density lipoproteins changes, even though total serum cholesterol is unchanged. From these studies, more effective recommendations for dairy product consumption in a well-balanced diet will be possible.

Dietary Zinc and Zinc Binding Protein Synthesis. Research at the New Jersey State Agricultural Experiment Station has shown that various dietary components markedly influence the absorption of zinc, an essential trace element. These components are more prevalent in human milk than cows milk. For this reason, zinc in human milk is more readily absorbed. The influence of serum albumin on zinc absorption was also examined as were the rates of absorption. The effects of hormones, glucagon and glucocorticoids, on the synthesis of metallothionein, a zinc binding protein were examined. The gene for metallothionein mRNA has been cloned by recombinant DNA techniques. This is being used as a probe to measure the regulation of this protein by dietary zinc changes, infection, trauma and hormonal changes. The work provides new insight into the metabolism of this dietary component, which is critical for reproduction, growth, host-defense to infection, and developmental processes, and how these are related to diseases.

Red Meats Vindicated As Cholesterol Culprits. Researchers at the Missouri State Agricultural Experiment Station fed a group of subjects a diet which included one egg plus at least 4 ounces of beef or pork daily for 3 months; another group were fed a similar diet in which fish or poultry was substituted for beef and pork. The results indicated that the meats and eggs did not cause significant changes in serum cholesterol levels in individuals who had the genetic ability to handle cholesterol. The implications of these studies should be considered by groups making dietary recommendations.



Predicting Shelf-Life of Processed Foods. Whether food is open dated by pack date, sell-by date, use-by date, or best if-used-by dates, the task a food processor faces remains the same: determining as accurately as possible the shelf life of a product. To solve this problem, Minnesota State Station food scientists have developed a new procedure for determining shelf life. The results show that shelf life can be predicted more accurately by testing an unpackaged product under constant high temperatures and humidities. Simple mathematical models are used to predict what the extent of quality change would be in any variable environmental condition from constant storage test data. Use of the results from these accelerated storage studies will mean that consumers can have greater confidence that the open dated foods they buy will still be as fresh as possible and have nutrient values consistent with those stated on the package.

New Food Containers of the Future. Packaging costs have continued to rise so rapidly that with some canned foods, the container costs more than the food product inside it. In Japan and Europe the "flexible can" called the retort pouch has been widely adopted to help alleviate this problem; however, the use of the pouch in the U.S. market still remains small due to the high initial investment in sterilization equipment. The pouch requires special handling and conventional canning lines are not suitable. Indiana Agricultural Experiment Station University food scientists have developed a cylindrical rack that holds four pouches. The rack is identical in size to a No. 10 can and can be handled with various conventional canning systems. This development should allow for the quicker testing and adoption of the pouch and aid in the reduction of costs to the consumer.

Frozen Milk Concentrate Developed. Frozen milk concentrate may soon be marketed like frozen orange juice. Processing technology, developed by food scientists at the Wisconsin State Agricultural Experiment Station, results in a product that tastes identical to fresh milk when reconstituted from the frozen concentrate. Other advantages of the technology would be reduced shipping costs, longer storage life, and less waste from spoilage. The process also enables the production and marketing of lactose-free milk thus making the benefits of this excellent food available to lactose intolerant consumers.

Getting Started in Farming and Ranching. Agricultural economists at the North Dakota Agricultural Experiment Station have recently completed a study which determined the personal and financial characteristics of beginning farmers and ranchers. The results indicate that most beginning farmers begin in a father-son operating agreement. Only a few get started by renting or purchasing land. With the limited opportunities for young people to enter farming, State and Federal programs have been initiated to aid beginning farmers. The North Dakota researchers are studying the effectiveness of these programs.

Quality of Potato Tubers Improved by a Plant Growth Regulator. Scientists at the Idaho Agricultural Experiment Station have found that potato plants sprayed with the plant growth regulator, maleic hydrazide (MH) produce tubers that have reduced rates of sprouting, even when a consumer stores them in a dark closet or under the sink without light. It has also been found that tubers treated with the growth regulator have delayed rates of softening in storage so that tubers dug in September can be stored until July. Another benefit of treating the plants with this growth regulator is better starch retention and lower sugar content of the tubers. This is important to processors since tubers with high sugar levels produce lower quality, dark colored french fries and potato chips.

6. COMPETITION, TRADE ADJUSTMENTS, PRICE AND INCOME POLICY

Current activities: 7 percent of total Hatch funds for research. Included under this research program grouping are farm adjustments, prices and income, economic aspects of marketing and competition.

Selected examples of recent progress:

Use of Computers in Planning and Managing Swine Production Systems. A computerized decision model has been developed at the Indiana State Agricultural Experiment Station to assist farmers in designing, building and managing their swine enterprises. The model enables farmers to indicate personal preferences of family living level, leisure time and risk. The model also considers management ability and other resources available. Farmers can also indicate their production preferences such as high investment buildings and continuous farrowing or low investment buildings and no farrowing during corn planting. Information about prices of hogs and prices of inputs is also required. The model determines income, capital needs, cash flow, labor needs, feed required and buildings constructed for the present plan, a plan with specific changes indicated by the farmer such as increasing size or changing the type of building and a good plan developed by the simulation computer model. The farmer then has the opportunity to observe how changes compare to the present plan with regard to income, debt, cash flow and resource flow. Nearly 1,000 farmers have used this model for planning swine farms. Ratings of the model by farmers indicate that it is very useful for making swine management, building and growth decisions.

Potential for Improving Incomes of Small Farms in Vermont. Results of a survey conducted by agricultural economists at Vermont's Agricultural Experiment Station show that over half the operators of small farms in the State rely on full-time employment off the farm to support themselves and their families. Despite this, most were optimistic about the potential for small farms and expected to stay in farming. About half even planned farm expansion to improve their incomes. Over half of the farm operators had more than 20 years experience in agriculture, dispelling the widely held notion that small farm operators are young, new to farming, and not very experienced. But the small farm could not support the operator and his family without added income, often from interest, pensions, Social Security, or rents, in addition to the money earned at other (non-farm) jobs. The survey also showed that most small farm operators relied on private sales and did not sell through farmers' markets. It also pointed out that the majority of the work of running the farm was done by the farmer and his family. Even though most operators of small farms had good credit potential, they preferred to remain debt-free and deal with money problems without borrowing. Most operators reported few other problems that were not money-related, and they expressed general satisfaction with their situations. The results of the research indicate that the population on small farms will remain fairly stable as long as off-farm employment opportunities are available to supplement farm families income.

The Economic Impacts of the Commercial Pond-Raised Catfish Industry in Mississippi. An economic analysis was recently completed by researchers at Mississippi State Agricultural Experiment Station that measured the economic contributions of the pond-raised catfish industry on the State's economy since it began in the early 1960's. During less than a decade, pond catfish culture has become a \$60 million (farm value, 1980 estimate) industry in the state. Its contribution to economic growth in Mississippi is much greater than the \$60 million farm value since feed manufacturing, fishery supplies, catfish processing, and many other support industries have been established.

## COOPERATIVE FORESTRY RESEARCH

The Cooperative Forestry Research (McIntire-Stennis) program is planned and directed to provide answers to the complex questions that face forest land managers seeking to produce an adequate timber supply for home and other uses. Timber production and wood utilization and distribution systems are key elements of forestry research. The research also deals with the demands for wildlife production and recreational opportunity on forests. Acceptable level of environmental quality in all forest operations and uses is an important national goal to which this research is dedicated.

In addition, the McIntire-Stennis program has the objective of helping to create and maintain a highly qualified corps of forest scientists through involvement in the research projects beginning as graduate student assistants. These young men and women serve in private industry, and in various levels of government as managers and scientists as our efforts to produce more goods and services per acre of land intensifies with time.

Following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: The following research program activities encompass the range of research funded under this act:

Multi-resource inventory, appraisal and evaluation. Assessment of supply, growth and demand, new inventory methods, alternative and multiple uses, economic and social benefits.

Forest resource management. Land productivity and forest growth, reproduction of trees and stands, improved varieties, institutional regulations and forest management.

Forest protection. Systems for detecting and evaluating losses to insects and diseases; control methods; fire detection, monitoring, and control.

Harvesting, processing, marketing. Energy efficient equipment; environmental concerns; wood properties and uses; biomass for energy; rural development role of forests and forest industry.

Forest watersheds, soils, pollution. Quality, quantity water production; effects of forest management on nutrient cycling, water quality and productivity; effects of sewage disposal; air quality effects, amelioration of air and noise pollution.

Forest range, wildlife, fisheries habitat. Use and effect of grazing, forest-range management, wildlife habitat maintenance, costs and benefits.

Forest recreation and environmental values. Recreation opportunity expansion methods; demand, cost and benefit analyses; environmental quality improvement; effects on forest environment.

Selected examples of recent progress:

Better and Cheaper Waterproof Wood Glues Made by Using Chemical Extracts From Forest and Agricultural Residues. Research at the University of Georgia, School of Forest Resources, has pointed the way toward faster setting and less expensive waterproof adhesives for wood gluing. Through the use of chemical extracts from forest and agricultural residues to



replace portions of the petrochemical raw material normally used adhesives of both lower cost and improved properties are possible. In particular, phenol-like extracts from peanut hulls or pecan nut pit have been successfully used to replace up to 50 percent of the standard petrochemical phenol in resin glues for bonding plywood, particleboard, etc. Not only can the new, residue copolymer resins be less expensive, but tests show some of them to have faster setting times, thus allowing for further economies due to increased production with a plant's existing equipment. The basic savings with these new resins come from the lower cost of the residue extracts as compared to standard phenol. Direct savings of up to \$9 million a year or more have been estimated for the U. S. softwood plywood industry alone. Additional indirect savings would come from the higher production rates possible.

Maximizing Resin Efficiency in Fiberboard. Wood scientists at Mississippi State University have found a method of improving the resin efficiency in wet-processed fiberboard. This research finding is significant in that resin cost represents approximately 10 percent of the total material costs in fiberboard production. The researchers determined that a direct relationship exists between a prerefining steam treatment of the wood chips and the physiochemical surface characteristics of the fiberized wood. Thus, the surface of the fiber can be manipulated to improve the compatibility of the resin and wood fiber leading to improved resin efficiency. Therefore, lower total production cost.

Alcohol and Energy From Wood. A unique system has been developed at the University of California for the complete conversion of lignocellulosic materials into ethyl alcohol for use as a gasoline additive, methane, and thermal energy. By a sensitized hydrolysis step, wood and woody plants are converted to an aqueous solution of their component sugars and a solid ligneous residue. The sugars are then converted to ethyl alcohol by conventional fermentation and distillation. Organic solids from hydrolysis are converted by wet oxidation to soluble products which are converted to methane and thermal energy. Each of these products provide energy sources from lignocellulosic materials such as agricultural residues. The process is being implemented on a commercial scale.

Windbreaks Increase Grain Production in Conditions of Environmental Stress. Grain producers in the Great Plains can realize increased yields by maintaining existing windbreaks and/or planting new ones. Research at the University of Nebraska has shown yield gains in winter wheat large enough to more than compensate for the area planted to trees. The amount of benefit derived from a windbreak in any given year is dependent on environmental conditions; the more extreme the conditions, the greater the potential benefit. However, a producer should realize an average increase of 10 to 20 percent over the normal life span of the windbreak. These gains are exclusive of the value of windbreaks in reducing wind erosion and top soil loss.

Large Genetic Variation in Sycamore Offers Potential for Productivity Gain. Investigations in the Department of Forestry, Mississippi Agricultural and Forestry Experiment Station, have provided new insights into the potential role of forest genetics and tree breeding in developing American sycamore. Interest has been expressed in the use of American sycamore for conventional fiber production and as a potential source of forest biomass for use as an energy source material. The Department of Forestry has studied the genetic characteristics of sycamore throughout the gulf-south. Research results have identified large genetic variations in growth rate and disease resistance, preferred geographic sources of genetically superior sycamore, and opportunities to increase per acre fiber production by 50 percent using genetically superior sycamore trees.



Cloning Offers Possibility for Rapid Genetic Improvement in Hardwoods. Recent success in cloning several species of economically important hardwoods by researchers at the Georgia Agricultural Experiment Station will lead to significant increases in wood yields in the next 2 or 3 decades. The application of high intensity, short rotation forest management to obtain maximum yields of wood for fiber, energy and chemical feedstock will require large quantities of genetically improved planting stock, and millions of seedlings will likely come from clonal lines of rapidly growing hardwood strains. Techniques developed within the past two years now make it possible to obtain over one million genetically identical seedlings within a period of a year or less from a single bud of a genetically superior tree. Presently the cost of seedling production using tissue culture techniques are from 2 or 3 times higher than conventional nursery stock, but a recent development leading to embryo formation in liquid cultures will reduce production costs as much as 50 to 80 percent making the cost of genetically improved clonal lines competitive with nursery grown seedlings. Hardwood species successfully cloned are sweetgum, sycamore, black locust, tulip poplar, red maple and alder species. Researchers estimate that gains by genetic selection and cloning combined could increase yields of wood by as much as 20 to 30 percent over ordinary planting stock. This could eventually result in a total volume increase of about 3 million cords per year on some 9 million acres of hardwoods in Georgia alone, increasing the stumpage value of managed forests by approximately \$25,000,000 each year.

Prediction of Mountain Pine Beetle Attack and Subsequent Biomass Growth Facilitates Production Planning by Land Managers. The mountain pine beetle is a major insect pest of the ponderosa pine forest which includes 28 million acres of valuable commercial timber land in North America. Recently over 250,000 acres of ponderosa pine were severely infested by the mountain pine beetle in South Dakota and in the Colorado Front Range. Studies at Colorado State University have revealed up to 37 times increase in understory biomass under beetle killed pines than under live non-infested pines. This greater understory biomass increases both wild and domestic herbivore forage. A model has been developed to predict the understory productivity of forbs, grasses, sedges and shrubs on these infested sites. This model has important implications as a management tool, allowing understory biomass to be predicted for up to 10 years following beetle kill. A second model has been developed which predicts soil moisture in ponderosa pine sites of the Front Range using site factors such as basal area, slope and aspect. Soil moisture is closely correlated with initial beetle attack, since those trees attacked first in an epidemic are those with the highest water stress. This predictive model may play an important role in helping forest managers detect sites which are highly susceptible to pine beetle attack.

#### 1890 COLLEGES AND TUSKEGEE INSTITUTE

A formula funded research program for the 1890 Colleges and Tuskegee Institute was established in the Food and Agriculture Act of 1977. Section 1445 of P.L. 95-113 authorized annual appropriations to support continuing agricultural research at the 1890 Colleges and Tuskegee Institute and funds were appropriated beginning in fiscal year 1979.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: The 1890 Colleges and Tuskegee Institute previously received funds for research under the authority of Public Law 89-106, which gives grant authority for awards up to 5 years. At the present time, there are 160 active Public Law 89-106 research grants that support research projects being conducted at these

institutions. The existing grants will be carried through to termination by the end of fiscal year 1983.

The annual research program at the 1890 Colleges and Tuskegee Institute places emphasis in the areas of human nutrition, rural development and quality of living, and limited resource farming.

The research projects currently being conducted in the 1890 Colleges and Tuskegee Institute are distributed into several research programs as follows: natural resources, 9 percent; crop resources, 25 percent; animal resources, 30 percent; people, communities and institutions, 33 percent; and competition, trade adjustments, price and income policy, 3 percent.

Selected examples of recent progress:

Soil Fertility Research to Increase Soybean Yields. Soybean yields are relatively low compared to the yields of other grain crops. Traditional methods of applying nitrogen fertilizers to soil have failed to increase soybean yields. Apparently, this is due to the depressing effect of nitrogen fertilizers on the symbiotic nitrogen fixing activity in soybeans. Applying nitrogen directly to the plant as a spray seems to have some promise according to researchers working at Southern University (Louisiana). When nitrogen is applied to the plant directly as a foliar spray during reproductive stage, the plant directly absorbs the nutrient through its foliage and utilizes it in grain production. Such practice is expected to increase soybean yields significantly at a low cost.

Sweet Potato Cultivars. Tuskegee Institute scientists have developed, named and released to growers under certification three high quality sweet potato varieties. Regional trial data has shown 'Carver' and 'Tuskegee 100' to have a higher vitamin A content and an excellent level of pest resistance than other varieties presently being produced. 'Rojo Blanco' a white flesh variety is presently being recommended across the South for ethanol production, because of its high biomass (35-40 percent). These varieties have returned to growers pockets more than 10 times the cost of the research over a 6-year period. This crop lends itself to small and limited resource farmers.

Sunflowers in Arkansas. Oil-type sunflowers should become a profitable crop to grow in rotation with soybeans in the South. Initial results from studies being conducted by scientists at the University of Arkansas Pine Bluff Research Station showed that sunflowers are more drought tolerant than soybeans and not affected by the soybean cyst nematode which infests millions of soybean acres in the South. Growing the nonhost sunflower crop in rotation with soybeans should help keep the cyst nematode population at a manageable level. Earlier planting (late March-early April) and considerable drought tolerance should allow sunflowers to return a higher profit than nonirrigated soybeans during droughty years. Early planted sunflowers normally mature before dry weather arrives in Arkansas. Also, because of its drought tolerance, sunflowers may have an advantage over soybeans in a double crop rotation with small grains. In order to realize the full profit potential of sunflowers, growers should plant varieties well adapted to their locality and soil conditions. With an expanded sunflower acreage in the South, the adverse effect on crop production from both the soybean cyst nematode and severe drought should be greatly minimized.

Adrenalectomy Procedure. Studies involving adrenal function in swine have been limited by high mortality rates in mature adrenalectomized swine. Lincoln University (Missouri) animal scientists have developed a method for removal of adrenal glands through two paralumbar incisions, without penetrating the peritoneum. The risks of fatal hemorrhage from the caudal



vena cava and irreversible shock as a result of prolonged exposure of the abdominal contents to room temperature are practically eliminated in this procedure. In addition, an injection of glucocorticoids during surgery is the only measure used to insure survival to 24 hours post surgery. Intramuscular injection of minerals and glucocorticoids every other day maintains the animals indefinitely. Thus, this three-hour procedure provides an experimental animal which is useful in stress-related studies in swine and which is potentially useful as an animal model for human studies.

Winter Feeding of Catfish Fingerlings. Fisheries research scientists at the University of Arkansas at Pine Bluff in collaboration with Mississippi State University fish biologists have further confirmed and documented the need to feed smaller, fingerling-size fish throughout the season. When the water temperature remains above 45 F, they should be offered a sinking pelleted feed in amounts directly related to the water temperature. Depending upon weather conditions, feeding may be done on 50 to 60 percent of the days between November through March in the South. Fish that received a 35 percent protein ration gained 18 percent, while fish which were fed 25 percent protein ration increased their weight by 24 percent. This confirms earlier studies which have indicated that fish do not require as much protein during the cooler season. Lower protein feeds are less costly than higher protein preparations, thereby combining winter fish production gains with less expense. Non-fed fish may lose at least 3 percent of their weight during the winter and also be more susceptible to disease during the following spring.

Behavior, Ecology and Rhythmicity in the Rock Crabs. Two species of edible rock crabs, Cancer irroratus and C. borealis, are found in Maryland waters and are under study at the University of Maryland Eastern Shore. Both inhabit colder water than the blue crab Callinectes sapidus and are, therefore, more common in the winter months. These crabs have been maintained for long periods in artificial seawater recirculating systems which allow them to perform their entire life cycle under controlled conditions. A high-protein, pelletized diet has been developed for rapid growth. Various aspects of the life cycle such as molting and reproduction appear to be under the control of photoperiod (light-dark relationships) and can be initiated in the laboratory by adjusting this variable. Controlling the growth and reproductive cycle of a marine crustacean provides basic information necessary for mariculture.

Potential for Increased Incomes. An optimum farm plan based on recommended production practices developed by scientists at South Carolina State College yielded a net return over 40 percent higher than that from the optimum plan based on the existing production practices of low-income farmers of the lower Coastal Plains area of South Carolina when the same resource constraints were used. The substantial increase in the net income was directly attributed to the adaption of modern technology and the most efficient utilization of existing resources. With the help of the linear programming technique, several such optimum farm plans have been developed to suit a wide variety of resource situations representative of the low-income farmers in the lower Coastal Plains area of South Carolina. These plans can be used as farm planning guides by the low-income farmers to enhance their income potential.

Food Intake and Plate Wastes of Low-Income Elderly. Researchers at University of Arkansas at Pine Bluff found that the diets of many elderly people were submarginal in several nutrients. Preliminary analyses have provided additional support of submarginal dietary levels among elderly people. The results have extended the data on food utilization and waste patterns of elderly consumers. Further, the significance of living arrangements, cultural and economic factors in food use and waste has been



identified for a broad range of items. These findings contribute much to explaining the food habits and nutritional problems of elderly people as well as the economic consequences of wasted food resources. Findings are potentially valuable in nutrition policy, planning and education for this age group.

Elderly Women Can Strengthen Their Fragile Bones by Supplementation With Calcium. Researchers at Kentucky State University found that 11 out of 20 elderly women living in Central Kentucky increased their bone density after 6 months of supplementation. Foods rich in calcium or calcium itself can be used as the supplement. The results suggest that some elderly persons even with a mean age of 70 years, can benefit from supplementary calcium and calcium-rich foods by improving their bone density.

Utilization of Sorghum and Wheat by Human Adults. The results of studies at Virginia State University indicate that high lysine variety of sorghum is more efficient as a protein supplement than wheat flour; sorghum is better utilized as a nitrogen source than wheat flour in human adults. The findings of the investigation will help the economically depressed groups to be able to get most of their protein needs from plants and be less dependent on costlier animal protein sources.

#### SPECIAL RESEARCH GRANTS

The Special Research Grants program concentrates on problems of national interest beyond the normal emphasis in the formula grant program.

Following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: In fiscal year 1982 under the Special Research Grants program, grants will be made to the four regional leader laboratories and the headquarters laboratory to continue the pesticide clearance research program (New York, Michigan, Florida, California, New Jersey) and to continue the on-going pesticide impact assessment program. Each of the agricultural experiment stations in Idaho, Oregon, and Washington will receive a grant to continue the research on soil erosion supported under this authorization. A grant involving 16 states also will be made to continue the program of research in food and agriculture policies. Grants will also be made in the areas of quayule research, germplasm resources and integrated pest management.

Included under the Special Research Grants program are grants for alcohol fuels authorized by Section 1419 of Public Law 95-113 and Native Latex grants authorized by Public Law 95-592

In fiscal year 1982 Special Research Grants will be awarded competitively, utilizing peer panels of scientists to evaluate the scientific merit of proposals in the areas of soybeans, energy, animal health, food quality and safety, aquaculture, antidesertification, and alcohol fuels research. Solicitation of applications for fiscal year 1982 grants to be awarded competitively will be published in the Federal Register. It is anticipated that grants will be awarded by August 1982.

One hundred and eleven Special Research Grants were awarded competitively in fiscal year 1981. Given below are details on the number of proposal submitted and the number of grants for each area.

<u>Specific Area of Inquiry</u>	<u>Number of Preproposals Submitted</u>	<u>Annual Request</u>	<u>Number of Grants Awarded</u>	<u>Amount of Awards</u>
P. L. 89-106:				
Soybeans	34	\$3,585,270	6	\$485,000
Energy	87	7,961,904	24	1,843,000
Animal Health	356	41,230,013	59	4,898,500
Antidesertification	38	6,805,016	8	970,000
Aquaculture	82	6,918,274	9	485,000
P. L. 95-113:				
Alcohol fuels	81	7,704,847	5	485,000

Selected examples of recent progress:

Development of a Protective, Non-Toxic Hemolytica Vaccine Against Bronchopneumonia in Calves. A new type of vaccine being developed at the School of Veterinary Medicine, Oregon State University, against Pasteurella, is composed of a purified capsular fraction of the bacteria in contrast to the whole bacterial cells used in the traditional vaccine. In trials in turkeys the vaccine has proved as effective and much less toxic than the traditional vaccine. Since the vaccine contains only definable immunogenic material, a quality control in the production phase can be easily accomplished. This would eliminate undesirable variation in protective quality seen in the type of vaccine available in the market. The vaccine is ready for use in poultry. A similar technology is being applied to develop a capsular vaccine against calf pneumonia caused by P.hemolytica. Pasteurella are believed to be a major cause of respiratory disease in cattle. An effective vaccine against these organisms has the potential for markedly reducing the \$500 million annual loss which now occurs from this disease.

Development of a Vaccine Against Strongylus Vulgaris in the Horse. Researchers at Louisiana State University School of Veterinary Medicine are studying new procedures for controlling Strongylus vulgaris infections in horses, a parasite causing millions of dollars in losses per year to the horse industry. Properly vaccinated horses were protected against clinical signs of disease, arterial lesions and the development of migrating larvae following challenge. In comparison, 60 percent of the non-vaccinated controls died and severe colic, weight loss, and arterial damage occurred in the surviving horses. In addition, culturing the larval stages of these parasites in the laboratory has been accomplished for the first time. These results will make further immunologic controls and diagnostic procedures for these and other parasites more feasible. Continued success with these vaccine studies would revolutionize horse parasite control.

Two-way Tick Control. A two-pronged effort for tick control on beef cattle is yielding results at Oklahoma State University. Large pills, or boluses, and ear tags are impregnated with various chemicals and are designed to slowly release those chemicals over a long period of time. The boluses are about four inches long and are made to remain in an animal's digestive system, releasing daily doses of tick-killing chemical. They have shown 100 percent control over Gulf Coast ticks and 80 percent control of Lone Star ticks on cattle. Side benefits are being found with the boluses, such as the capability to load them with other chemicals to control serious health problems such as anaplasmosis. Ear tags developed at Oklahoma State are now being sold commercially across the nation. Working on the principle used for dog and cat flea collars, ear tags impregnated with tick-controlling chemicals offer season-long control over Gulf Coast and spinose ear ticks, as well as horn flies.

Transmission of Viral Disease Through Embryo Transfers. The transplantation of fertilized ova to recipient females is becoming of practical importance in the conservation and expansion of desired genetic traits. But the process is not without potential problems. Purdue University scientists in the School of Veterinary Medicine have discovered a potential for the transmission of pseudorabies virus by embryo transfer. Pseudorabies is a highly important disease of swine that also affects other livestock, particularly cattle, resulting in high mortality in some herds. These studies are answering questions highly important to disease control by regulatory agencies such as APHIS. Such research is needed to clarify the risks involved in improving genetic stock through the import or export of fertilized embryos. It may provide clues to methods that will avoid such disease risks. Pseudorabies virus was selected as a model for this study because of the high priority the swine industry places on research on this disease.

Method Found for Preventing Lead Poisoning. Lead poisoning is a serious and often fatal problem in livestock due in part to the extensive use of lead preparations in agriculture. Chronic lead poisoning can be a serious human problem, particularly in children exposed to environmental sources. Unleaded gasoline is a recent attempt to reduce such exposure. In studies to reduce detrimental effects of lead in livestock, University of Tennessee scientists have discovered that high doses of thiamine (Vitamin B<sub>1</sub>) will provide effective protection in calves against lead poisoning. This discovery is the first observation of such an effect. Further evaluations are being made to determine minimum effective levels of thiamine required. Successful application of these results could provide substantial reduction of livestock losses from lead poisoning. Even more importantly, this research may provide a basis for preventing or reducing the effects of lead poisoning in people.

Producing New Germplasm in Corn from Relatives. Tripsacoid characteristics were successfully transferred by Illinois Agricultural Experiment Station scientists to cultivated maize Zea mays from Tripsacum dactyloides native to Illinois. Introgression requires a complex genetic system that induces intergenome pairing and the formation of restitution nuclei during macrosporogenesis. Once established in the Zea genome, tripsacoid traits are maintained in recovered maize through selection and hybridization among tripsacoid lines. Several dozen lines are being maintained in a germplasm bank. Tripsacoid characters in recovered maize lines of possible agronomic significance are disease resistance, induration of cob and stem, multiple ears, branched ears, tillering and gametophytic apomixis. Tentative genetic data suggest that most of these characters are highly heritable and can be incorporated into commercial corn hybrids.

Integrated Pest Management in Cotton. Entomologists and others at the Arkansas Agricultural Experiment Station, working with Extension Service personnel, are helping all cotton farmers within small communities reduce use of insecticides, thereby cutting production costs and also reducing environmental problems. The system makes use of integrated pest management systems, based on frequent, detailed observations of insect pests present in cotton fields within the community's boundaries, as well as consideration of the production practices that contribute to insect problems. These practices include such factors as stand densities and planting procedures, and also efficient use of fertilizers and herbicides. Producers agree to follow recommendations, and to apply insecticides only as recommended, but immediately, within a 2-day period. In 1976 the program was conducted in one Arkansas community involving 10,000 acres of cotton. Cooperating farmers applied chemical insecticides only twice during the season, in contrast to the 10-year average of 9 such applications, yet yields were not reduced. This year producers in four communities in different areas of the state have signed up for such a program, representing more than 75,000 acres



of cotton. Economists have estimated that the much more efficient insect control system results in a reduction of \$49 per acre in variable costs.

Soybean Seed Vigor. Good seedling vigor is important in obtaining good stands. A nondestructive method of measuring seedling vigor can greatly facilitate selection to improve seedling vigor. Research at the Boyce Thompson Institute, Cornell University, has developed a nondestructive test for vigor of individual soybean seeds by measuring solute leakage from seeds. The test is correlated with growth vigor of seedlings and has established genetic differences. This opens the way for screening and selecting soybean germplasm for seedling vigor.

Nitrogen Fixation in Soybeans. The soybean plant must supply energy to the symbiotic rhizobia in the nodule. There has always been a question about the energy cost of nitrogen fixation and the impact of this energy drain on seed yield. Research conducted at the University of Illinois found that soybeans supplied with nitrate nitrogen were 18 and 50 percent greater in shoot and root growth, respectively, than nodulated plants when measured 32 days after sowing. Nodulated plants required 66% more glucose (from photosynthesis) to fix nitrogen than to assimilate nitrate. However, seed yields were similar. The research emphasized the importance of nitrate to early vegetative growth and seed growth and suggests that the energy required to fix nitrogen does not necessarily lower seed yield.

Soil, Water, and Crop Management. The losses of soil and water runoff from farmland in the Pacific Northwest are extremely serious as they affect future productivity of the land. A coordinated 3-state, multi-disciplinary research program titled STEEP (Solutions to Environmental and Economic Problems) is designed to obtain answers to soil, water, and crop management problems. This information is essential so farmers can have practical methods of crop production which reduce soil and water losses to an acceptable rate while maintaining or increasing productivity. Tillage systems including conventional methods, minimum till, and no-till are being evaluated at several locations. Idaho Agricultural Experiment Station researchers have shown that after a fertilizer nitrogen application, nitrate nitrogen in the soil is lowest under no-till, intermediate for minimum till, and highest for conventional tillage. Distribution of available nitrogen within the soil was different as well. Disease and weed problems were more severe in the no-till system; however, certain 3-year cropping sequences were much superior to some 2-year sequences. More study of the interactions of soil fertility, cropping sequences, disease, and weeds should produce good results.

Research by Washington State Agricultural Experiment Station scientists has shown a much greater need for P (phosphorus) fertilizers by winter wheat planted by no-till procedures as compared to conventional tillage. Fertilizer placement problems, as well as understanding needed rates, are more complex with minimum-till or no-till methods, and nutrient availability in the soil is somewhat lower. Erosion of soils is a selective process as related to soil particle size. In long term runoff plots near Pullman, there was a decrease of about 16 percent in total P content of redeposited sediment as compared with the original hillside. This is caused by a relatively greater P content of the finer particles of soil which are more likely to be carried by water to streams and lakes.

Oregon Agricultural Experiment Station researchers obtained results that indicate lowering the water table in some Western Oregon soils, by use of tile drainlines, reduced sediment production in lower landscape positions as compared with upper landscape positions. The drainlines affected surface hydrographs by lowering peak flows, increasing response time to reach peak flow, and reducing base flow.

# COMPETITIVE RESEARCH GRANTS

The Competitive Research Grants program was initiated by the Department in 1978 to fund basic research in selected high priority areas related to plant production and human nutrition. The competitive grants complement the on-going research efforts of the USDA and the traditional agricultural research community by obtaining the participation of research scientists throughout the entire U.S. scientific community who have outstanding expertise in these related areas.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: Five targeted areas were identified as possessing great opportunities for scientific discoveries and for contributing to applied research vitally needed on important food problems. There are four target areas relating to crop productivity: photosynthesis, biological nitrogen-fixation, genetic mechanisms for crop improvement, and plant protection from biological stresses (e.g., insects, pathogens, viruses, and nematodes). The target area in human nutrition relates to establishing human nutrient requirements.

The Competitive Research Grants Office received 793 research proposals in FY 1981 requesting about \$140 million for support of research in the targeted areas. From these proposals, 207 grants were made in the areas, for the amounts, and to the types of research organizations noted below. Approximately 20 percent of the dollars requested for research proposals that were rated good to excellent by the peer panels or ad hoc reviewers were funded. Given below are details on the number of proposals submitted, the number of grants awarded and the major categories of grantee organizations.

	<u>Proposals Received</u>	<u>Dollars Requested</u>	<u>Grants Awarded</u>	<u>Dollars Awarded</u>
Plant Biology				
Biological Stress	259	\$38,696,150	55	\$3,395,000
Genetic Mechanisms	168	30,706,676	55	3,395,000
Nitrogen Fixation	101	17,964,787	31	2,910,000
Photosynthesis	96	15,237,010	38	2,910,000
Subtotal	<u>624</u>	<u>102,604,623</u>	<u>179</u>	<u>12,610,000</u>
Human Nutrition				
Nutrient Requirements	<u>169</u>	<u>36,717,301</u>	<u>28</u>	<u>2,910,000</u>
TOTAL	793	139,321,924	207	15,520,000
	<u>Proposals Received</u>	<u>Dollars Requested</u>	<u>Grants Awarded</u>	<u>Dollars Awarded</u>
Lardd-Grant Universities	513	\$84,816,141	142	\$10,161,200
SAES	(437)	(70,998,465)	(115)	(8,120,100)
Non-SAES	(76)	(13,817,676)	(27)	(2,041,100)
Land-Grant 1890	6	875,354	- -	- -
Private Universities	79	17,529,530	25	2,137,000
Public Universities	117	22,740,285	20	1,553,800
Federal Laboratories	2	217,346	- -	- -
USDA/ARS	37	5,131,038	9	660,000
Private Non-Profit	32	7,186,067	9	791,000
Private Profit	4	530,253	1	142,000
State and Local Agencies	1	107,003	1	75,000
Other Public Foundation	1	30,554	- -	- -
Veterinary Colleges	1	158,353	- -	- -
	<u>793</u>	<u>139,321,924</u>	<u>207</u>	<u>15,520,000</u>

Selected examples of recent progress:

Differential Gene Expression in Maize. Growth and development of all plants are ultimately determined by the information stored in their genes, although environmental factors are known to interact with the process of information transfer from the genetic codes to the final gene product. Most are turned on and off at a specific time and in a specific organ according to the program unique to each plant. This phenomenon is called differential gene expression and has long been considered to be the most fundamental process in plant development. An understanding of this process is a prerequisite to any future attempt to increase crop production through gene manipulation. An investigator at North Carolina State University has been studying differential gene expression using maize catalase; an enzyme involved in various aspects of plant metabolism. There are three catalase genes in maize, each active at different stages of development. A molecular probe has been developed for the purpose of identifying genomic DNA sequences for each catalase gene. Once the entire DNA sequences become known for each catalase gene, it will tell us what structural features of the genes are important in determining the pattern of their expression.

Colorado Potato Beetle Management. The Colorado potato beetle is a serious pest of a number of crop plants. It is also resistant to a number of insecticides. This research is focused on using a fungus, Beauveria bassiana, to control the damage caused by this insect. Scientists at Boyce Thompson Institute at Cornell University and the USDA-ARS have collaboratively isolated strains of the fungus which show economically significant levels of control of the Colorado potato beetle. The system is under refinement to improve longevity and effectiveness of the control agent. Work is also underway to understand why selected strains of the fungus are more effective as insect pathogens. This research will provide both applied and basic information on alternative methods of pest control.

Chemically-Mediated Host Finding Behavior of Plant Insects. Research at Michigan State University has increased our knowledge on how insects find their host plants. Onion fly adults were found to be positively attracted to damaged and decomposing onions. The volatile components are presently under investigation with a view to determining their chemical composition. During the course of this work these workers have developed an inexpensive and effective technique for trapping onion flies. These traps were found to be especially useful in monitoring the populations of these insect pests. Knowledge from this research promises to provide us with an increased understanding of the biology of these insects and a mechanism for determining the levels of insects which are capable of causing economic damage to plants

Bacteroid Development and Dinitrogen Fixation in Alfalfa Nodules. A group at the University of Houston is studying the relationship between the population dynamics of bacteroids in alfalfa nodules and the activity of their nitrogenase, the enzyme that catalyzes the fixation of atmospheric nitrogen to ammonia. They have found that nodules that are most active in nitrogen fixation contain larger populations of bacteroids. Furthermore these bacteroids are larger and have increased DNA and RNA content. As the nodules age, the proportion of bacteroids with the high nucleic acid contents decreases along with a decrease in the specific activity of the enzyme. This relationship was also observed when the foliage of the host



plant was removed, forcing senescence. Thus the investigators have shown a direct correlation of bacteroid number, size, and nucleic acid content with the activity of the nitrogen fixing enzyme.

Synthesis and Transport of Sucrose in Crop Plants. In plants, the fixation of carbon dioxide occurs in the chloroplasts of the leaf cells. Following the initial fixation, the carbon dioxide is converted by a series of intermediate steps into more complex compounds. These compounds are major food products of photosynthesis, such as starch and sucrose. Sucrose is the principal transport sugar in crop species. It is important to understand both the mechanism and the factors regulating its synthesis. It is made outside the chloroplast, in the cytoplasm, which means that after the initial carbon dioxide fixation some of the intermediate compounds must be able to pass through the chloroplast envelope. An investigator at Washington State University, by isolating whole leaf cells and chloroplasts from several crop species, has found that there is more than one metabolic pathway for sucrose synthesis. He has also determined which sucrose precursors pass through the chloroplast envelope and which steps in sucrose synthesis occur in the cytoplasm.

Factors Influencing Folate Status During Infancy. Researchers at the University of Illinois are studying factors which influence folic acid nutrition during infancy. Folic acid is a B-vitamin essential for cell replication and growth. Infants are enrolled in the study from birth, followed for one year and grouped according to the type of milk consumed. Results to date indicate that type of milk consumed during infancy has a direct influence on blood levels of folates. Formula-fed infants experience a significant rise of blood folates at six weeks and a further rise at three months. In contrast, human milk fed infants show a decline in blood folates at six weeks which remains at that level at three months. These different developmental patterns of blood folates are directly related to total amount of folic acid consumed. Neither the consumption of solid food nor the provision of supplemental iron via formula was found to influence blood folate levels of bottle-fed infants. These data indicate quantities of folic acid for growth and development. Maternal folate nutrition was found to have a direct influence on human milk folate content, and in turn on infant folate nutrition. These data stress the importance of supplying sufficient folic acid to the nursing mother to insure an adequate supply to her infant.

Pantothenic Acid Nutritional Status of Humans. Researchers at Utah State University have established the human nutritional requirements for pantothenic acid, a B-vitamin. In the past, investigators have been unable to define the need for this vitamin because the assay methods were unreliable. A new technique, a radioimmunoassay, developed by these researchers enable them to estimate with confidence the amount of the vitamin consumed in a mixed diet by the population to be 2.9mg/1000 Kcal. Estimating the pantothenic acid in the food supply has become increasingly important since pantothenic acid is generally not added to foods through fortification and thus it can serve as an indicator or marker for other important nutrients such as manganese, copper and biotin. Specifically the pantothenic acid status of groups at increased nutritional risk such as the elderly and lactating women has been assessed. Because of this effort the Food and Nutrition Board of the National Academy of Sciences will be in the position to state with certainty the dietary allowance of this important nutrient in the future. As other investigators have become aware of this work, Utah State University has been asked to supply antibodies to pantothenic acid, essential for the assay technique.

## ANIMAL HEALTH AND DISEASE RESEARCH

The Animal Health and Disease Research (Section 1433, Public Law 95-113) program is directed to improving the health and productivity of animals and the welfare of producers and consumers of animal products; protecting human health through control of animal diseases transmissible to humans; minimizing livestock and poultry losses due to transportation and handling; and facilitating the effective treatment and prevention of animal diseases.

The following is a description of current activities and selected examples of accomplishments from these appropriated funds:

Current activities: Fiscal year 1981 is the third year in which the Section 1433 program has been active. Institutions receiving FY 1981 funds include 40 State Agricultural Experiment Stations and 16 Colleges of Veterinary Medicine qualifying individually; 11 such Stations and Colleges qualifying as combined institutions and one College of Veterinary Medicine. One new institution (Tufts University, College of Veterinary Medicine) established eligibility for FY 1981 funds. One institution (Lehigh University) discontinued participation at its request.

Recommendations of the Animal Health Science Research Advisory Board are being followed in program implementation (i.e., scope and priorities of eligible research, determination of research capacity of eligible institutions and other questions on program administration). In accordance with advice of the Board, emphasis in this research centers on the solution of high priority diseases or other animal health hazards in the production of livestock, poultry, and aquaculture species.

State Comprehensive Plans for animal health research, approved by CSRS are being followed by the eligible institutions within each State. These plans include the major areas of animal health research to be conducted by the institutions and mechanisms to assure effective coordination of research among the institutions. Provisions of Section 1433 project implementation permits selection of studies within each State based on highest priority needs and capabilities of the institutions to conduct the needed research.

Research is in progress on more than 400 projects seeking solutions to infectious and noninfectious disease or parasite problems of food animals and horses. Strong emphasis is being placed on solution to respiratory, enteric and reproductive diseases. Other major problems such as mastitis, pseudorabies, brucellosis and pinkeye are being investigated. Causes of disease are under study; new methods for disease diagnosis and carrier detection are being sought; new or improved treatments are being tested; methods of increasing resistance to disease are being developed; and biological methods to replace chemical control of livestock insects and internal parasites are being evaluated.

More than 90 projects were new in fiscal year 1981, providing re-direction of effort toward particularly promising approaches. These new research efforts are being applied to solve problems such as mastitis, reproductive diseases (including brucellosis) and gastrointestinal diseases. New or improved vaccines are being developed to control these diseases and other high priority problems such as bovine leukemia, salmonellosis, bluetongue and TGE. New medical technology including genetic engineering, monoclonal antibody and virus fingerprinting procedures are being employed to accelerate needed breakthroughs.

Selected examples of recent progress:

Model for Evaluation of Vaccines and Treatments for Shipping Fever.

Scientists at Oklahoma State University have developed a model for testing the effectiveness of vaccines and treatment regimens for shipping fever (pneumonic pasteurellosis) of cattle. The Bovine Respiratory Disease Complex (BRD), of which pneumonic pasteurellosis is a major component, is estimated to cause death losses of more than \$500 million annually. Additional losses incurred through medication cost and loss of efficiency in production of survivors of BRD represent expense far in excess of the death loss. The control of the disease by vaccination has been hampered by the lack of a reproducible method to evaluate vaccine efficacy in the calf. Scientists at Oklahoma State University have developed a reproducible evaluation and have now been able to evaluate immunizing agents against *Pasteurella haemolytica* and *Pasteurella multocida*. The methods developed by these scientists have enabled them to ascertain that aerosol exposure to the bacterial vaccine is more efficient in protecting against BRD than by direct injection. The methods are also helping to ascertain the mechanism(s) of resistance of the bovine lung to infection.

Effect of Air Exchange Rates on Respiratory Disease in Housed Calves.

Cooperation between agricultural engineering and veterinary medicine researchers at the University of Minnesota is paying off by finding ways to reduce calfhood mortality in Minnesota's dairy industry, the nation's third largest. Each year pneumonia and other calfhood diseases kill 15 to 25 percent of the dairy calves born on Minnesota farms. The research focuses on improving the environment of calf housing by correcting ventilation and sanitation shortcomings. It has demonstrated conclusively the value of adequate air exchange rates for prevention or reduction of respiratory disease in calves raised in insulated housing. A standard minimum ventilation requirement has been identified which has resulted in a marked decrease in respiratory disease. Other studies have been initiated to assess the effect calfhood pneumonia has in reducing the hereditary production potential of dairy cows. The project is serving as a base of a program that improves calf health on cooperating dairy farms in the State.

Pathogenetic and Immunologic Studies of Infectious Diseases of Cattle and Sheep. The cause of a substantial proportion of respiratory diseases of livestock remains a mystery despite massive searches by conventional means to find bacteria, viruses and other agents. The discovery of the cause of Legionnaire's disease in man involved new techniques which have now been applied to livestock. Scientists in the College of Veterinary Medicine and Biomedical Sciences, Colorado State University, found that some livestock had been exposed to Legionnaire's bacteria or related organisms. Because many pneumonias of livestock species resemble Legionnaire's disease in other ways, this finding opens new possibilities for determining the cause and developing methods of prevention and treatment of more animal pneumonias.

Development of a Vaccine for Pinkeye. Pinkeye (infectious bovine keratoconjunctivitis) is the most common infectious disease of the eyes of cattle. The disease causes partial loss of sight and, therefore, the affected animal does not eat and does not make satisfactory weight gains. As a result of an outbreak of this disease, the livestock owner suffers serious economic losses, usually in the thousands of dollars.

University of Florida scientists have developed a vaccine, derived from the causative agent *Moraxella bovis* and killed by gamma irradiation, which decreased infection rates by 10 percent. Another bacterium isolated from the eyes of normal cattle when administered two weeks prior to *M. bovis* challenge prevented the development of infections, possibly by causing a



three fold increase in local protective antibody production. This bacterial agent is being investigated as a possible mechanism for the development of an effective vaccine for the disease. A satisfactory vaccine is not available at this time.

Intranasal Immunization - Pseudorabies. North Carolina veterinarians have perfected a vaccine for pseudorabies that is superior to modified live virus vaccines and inactivated vaccines. The vaccine has been used in young pigs which were then challenged with a virulent strain of pseudorabies virus. The vaccinated pigs did not shed virulent virus, but pigs vaccinated with commercially available vaccines, either live, modified or inactivated when challenged shed virulent virus up to 8 days. The experimental vaccines produced higher serum antibody response than the commercial vaccines and the vaccine did not interfere with a new blood test used to detect pigs infected with the disease. The work will be expanded and the vaccine used under field conditions.

Cell Mediated Immunity in Swine Dysentery. A Tuskegee Institute scientist at the School of Veterinary Medicine has successfully developed experimental immunizing agents that will reduce the losses from swine dysentery (SD). The new vaccine works by delaying signs of the disease in some animals, while suppressing and preventing those signs in other animals. Whole cells and subcellular immunogens from the agent causing swine dysentery were used to prepare the vaccine. Swine dysentery is one of the enteric diseases the swine industry ranks as high priority for additional research. Enteric diseases in swine cost the swine industry \$150 million per year.

Bluetongue Vaccine in Sheep. Scientists at the Texas A&M University have developed a multivalent bluetongue vaccine for sheep that appears to be safe and effective under laboratory and field conditions. The vaccine provides protection against four strains of bluetongue virus occurring in the United States. Bluetongue is a disease of sheep, cattle, goats and wild ruminants. It causes serious losses in sheep in the Southwest and a milder disease in cattle. It is transmitted by gnats. Because of the presence of the disease in sheep, cattle, and goats in the U.S., the export market of breeding animals has been limited.



## EXTENSION SERVICE

### Purpose Statement

Cooperative extension work was established by the Smith-Lever Act of May 8, 1914, as amended. The legislation authorizes the Department of Agriculture to give, through the land-grant colleges, instruction and practical demonstrations in agriculture and home economics and related subjects and to encourage the application of such information by demonstrations, publications, and other means to persons not attending or resident in the colleges. This work is further emphasized in Title XIV (National Agricultural Research, Extension, and Teaching Policy) of the Food and Agriculture Act of 1977, as amended by the Agriculture and Food Act of 1981.

State and county extension offices in each State, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, American Samoa and Micronesia conduct educational programs to fulfill these requirements.

The Extension Service within the U.S. Department of Agriculture administers extension work nationally. As of September 30, 1981, there were 212 full-time permanent employees and 12 other than permanent employees, all located in the D.C. Metropolitan Area.





## EXTENSION SERVICE

### Purpose Statement

Cooperative extension work was established by the Smith-Lever Act of May 8, 1914, as amended. The legislation authorizes the Department of Agriculture to give, through the land-grant colleges, instruction and practical demonstrations in agriculture and home economics and related subjects and to encourage the application of such information by demonstrations, publications, and other means to persons not attending or resident in the colleges. This work is further emphasized in Title XIV (National Agricultural Research, Extension, and Teaching Policy) of the Food and Agriculture Act of 1977, as amended by the Agriculture and Food Act of 1981.

State and county extension offices in each State, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, American Samoa and Micronesia conduct educational programs to fulfill these requirements.

The Extension Service within the U.S. Department of Agriculture administers extension work nationally. As of September 30, 1981, there were 212 full-time permanent employees and 12 other than permanent employees, all located in the D.C. Metropolitan Area.

EXTENSION SERVICE

Available Funds and Staff-Years

1981 and Estimated, 1982 and 1983

Item	Actual 1981		Estimated Available 1982		Budget Estimate 1983	
	Amount	Staff Years	Amount	Staff Years	Amount	Staff Years
Extension Service.....	\$303,436,000:	213	\$315,702,000:	202	\$311,911,000:	147
Obligations under other USDA						
appropriations:						
Agricultural Stabilization and						
Cooperation Service-Rural Clean						
Water Project.....	133,926:		267,000:		267,000:	
Farmers Home Administration:						
Prairie View Conference.....	12,000:		17,000:		17,000:	
Counseling Housing Applicants..	50,000		72,000:		72,000:	
Farm Management.....	50,000:		73,000:		73,000:	
Community and Rural Development..	10,000:		14,500:		14,500:	
Food and Nutrition Service-Expanded:						
Food and Nutrition Program.....	500,000:		870,000:		870,000:	
Forest Service:						
Dutch Elm Disease.....	141,000:		204,000:		204,000:	
Community and Rural Development..	3,000:		4,500:		4,500:	
Boundary Water Canoe Act.....	153,000:		294,000:		294,000:	
Soil Conservation Service-Community:						
and Rural Development. ....	15,000:		146,800:		146,800:	
Economics Research Service-						
Community and Rural Development..	4,000:		131,800:		131,800:	
Rural Electrification Agency-						
Community and Rural Development..	3,000:		4,400:		4,400:	
FSIS-Chemical Residues.....	- -		250,000:		250,000:	
Total, Other USDA Appropriations..	1,074,926: --		2,349,000: --		2,349,000: --	
Total, Agriculture Appropriations..	304,510,926: 213		318,051,000: 202		314,260,000: 147	
Other Federal Funds:						
Reimbursements:						
AID-PASA.....	133,273:		193,000:		193,000:	
Department of Energy:						
Solar Drying of Crops.....	639,284:		1,072,000:		1,072,000:	
Solar Livestock Shelters.....	100,000:		145,000:		145,000:	
Department of Interior:						
Geological Survey.....	32,609:		47,000:		47,000:	
Fish and Wildlife Recognition						
Program.....	3,825:		6,000:		6,000:	
Career Development.....	- -		29,000:		29,000:	
Department of Labor-Manpower						
Workshop.....	34,885:		51,000:		51,000:	
Environmental Protection Agency:						
Pesticides in Soil.....	16,200:		24,000:		24,000:	
Pesticide Application Training	1,082,484:		1,860,000:		1,860,000:	
Water Quality Training.....	339,100:		637,000:		637,000:	
Food and Drug Administration:						
Mycotoxins.....	59,221:		86,000:		86,000:	
Health and Human Services:						
Family Matters.....	25,000:		36,000:		36,000:	
Navy-Home Economics project for						
families.....	37,000:		54,000:		54,000:	
Department of Transportation-Trans-						
portation Technical Assistance....	5,146:		7,000:		7,000:	
Total, Other Federal Funds.....	2,508,027: --		4,247,000: --		4,247,000: --	



EXTENSION SERVICE

CLASSIFICATION BY OBJECTS

1981 and Estimated 1982 and 1983

	<u>1981</u>	<u>1982</u>	<u>1983</u>
11 Total personnel compensation 1/..	\$5,211,000	\$5,053,000	\$4,103,000
12 Personnel Benefits	<u>25,284,000</u>	<u>25,784,000</u>	<u>26,989,000</u>
Total Pers. Comp. & Benefits.....	30,495,000	30,837,000	31,092,000

Other Objects:

21 Travel.....	546,000	575,000	459,000
22 Transportation of things.....	35,000	40,000	37,000
23.1 Standard Level User Charges.....	283,000	338,000	246,000
23.2 Communications, utilities and other rent.....	16,063,000	16,981,000	17,896,000
24 Printing and reproduction.....	177,000	184,000	170,000
25 Other services.....	2,413,000	4,426,000	4,194,000
26 Supplies and materials.....	152,000	160,000	148,000
31 Equipment.....	106,000	110,000	102,000
41 Grants, subsidies and contributions....	<u>253,166,000</u>	<u>262,051,000</u>	<u>257,567,000</u>
Total other objects...	<u>272,941,000</u>	<u>284,865,000</u>	<u>280,819,000</u>
Total direct obligations	<u><u>303,436,000</u></u>	<u><u>315,702,000</u></u>	<u><u>311,911,000</u></u>

Position Data:

Average Salary, ES positions.....	\$50,112	\$57,836	\$57,836
Average Salary, GS positions.....	22,269	23,906	26,569
Average Grade GS positions.....	9.82	9.88	9.90

1/ All employees are employed in Headquarters.



UNITED STATES DEPARTMENT OF AGRICULTURE

EXTENSION SERVICE

The new estimates include proposed changes in the language of this item as follows (new language underscored; deleted matter enclosed in brackets):

Extension Service

- Payments to States, Puerto Rico, Guam,[and] the Virgin Islands, American Samoa and Micronesia: For payments for cooperative agricultural extension work under the Smith-Lever Act as amended by the Act of June 26, 1953, the Act of August 11, 1955, the Act of October 5, 1962 (7 U.S.C. 341-349), section 506 of the Act of June 23, 1972, and the Act of September 29, 1977 (7 U.S.C. 341-349), and section 1361(c) of the Act of October 3, 1980 (7 U.S.C. 301n.) to be distributed under section 3(b) and 3(c) of the Act, for retirement and employees' compensation cost for extension agents, and for costs of penalty mail for cooperative extension agents, and State extension directors, \$219,376,000; payments for the nutrition and family education program for low-income areas under section 3(d) of the act \$60,354,000;
- 1 [payments for urban gardening programs under section 3(d) of the Act, \$3,000,000]; payments for the pest management program under section
- 2 3(d) of the Act [~~\$7,531,000~~] \$7,067,000; [payments for the farm safety program under section 3(d) of the Act, \$1,020,000] payments for the pesticide impact assessment program under section 3(d) of the Act, [~~\$1,850,000~~] \$1,716,000; payments for energy demonstration program under
- 3 section 3(d) of the Act, [~~\$324,000~~] \$285,000; [payments for non-point
- 4 source pollution program under section 3(d) of the Act, \$702,000; for carrying out the provisions of the Renewable Resources Extension Act of 1978, \$2,000,000] payments for extension work under section 209 (c) of Public Law 93-471, \$983,000; payment for extension work by colleges receiving the benefits of the second Morrill Act (7 U.S.C. 321-326, 328) and Tuskegee Institute under section 1444 of the National Agricultural Research,
- 5 Extension and Teaching Policy Act of 1977 (Public Law 95-113), as amended, [~~\$12,241,000~~] \$17,602,000; in all [~~\$309,381,000~~] \$307,383,000,
- 6 [~~of which not less than \$78,600,000 is for Home Economics~~]; Provided, That funds hereby appropriated pursuant to section 3(c) of the Act of June 26, 1953 and section 506 of the Act of June 23, 1972, as amended, shall not to be paid to any State, Puerto Rico, Guam, the Virgin Islands, American Samoa or Micronesia prior to availability of an equal sum from non-Federal sources for expenditure during the current fiscal year.

- Federal administration and coordination: For Administration of the Smith-Lever Act, as amended by the Act of June 26, 1953, the Act of August 11, 1955, the Act of October 5, 1962, section 506 of the Act of June 23 1972 section 209 (d) of Public Law 93-471, and the Act of September 29, 1977 (7 U.S.C. 341-349) and section 1361(c) of the Act of October 3, 1980 (7 U.S.C. 301n.), and to coordinate and provide program leadership for the extension and higher education work of the Department and several States and insular
- 7 possessions [~~\$6,321,000~~] \$4,528,000 ,[of which not less than \$2,100,000 is for Home Economics].(Public Law 97-103, making appropriations for Agriculture, Rural Development, and Related Agencies, 1982.)



The first change is for the purpose of deleting language which provides funds for the Urban Gardening program under section 3(d) of the Smith-Lever Act. No funding is proposed for this program in fiscal year 1983.

The second change is for the purpose of deleting language which provides funds for the farm safety program under section 3(d) of the Smith-Lever Act. No funding is proposed for this program in fiscal year 1983.

The third change is for the purpose of deleting language which provides funds for the nonpoint source pollution program under section 3(d) of the Smith-Lever Act. No funding is proposed for this program in fiscal year 1983.

The fourth change is for the purpose of deleting language which provides funds for the Renewable Resource Extension Act. No funding is proposed for this program in fiscal year 1983.

The fifth change is to include amendments as provided under section 1431 of the Agriculture and Food Act of 1981 as it relates to the 1890 colleges and Tuskegee Institute.

The sixth and seventh change are for the purpose of deleting the limitation established in the FY 1982 Appropriation Act on the amount of support for Extension's home economics program. This limitation conflicts with the primary intent of the Smith-Lever Act to give maximum latitude to the State Cooperative Extension Services to conduct programs according to the needs of their state.

EXTENSION SERVICE

Appropriation Act, 1982.....	\$315,702,000
Budget Estimate, 1983.....	311,911,000
Decrease in appropriation.....	<u>-3,791,000</u>

SUMMARY OF INCREASES AND DECREASES  
(on basis of appropriation)

<u>Item of Change</u>	<u>1982 Estimated</u>	<u>Program Changes</u>	<u>1983 Estimated</u>
Smith-Lever:			
For Sections 3b&c.....	\$219,376,000	--	\$219,376,000
Section 3d:			
Pest Management.....	7,531,000	-\$464,000	7,067,000
Farm Safety.....	1,020,000	-1,020,000	--
Energy.....	324,000	-39,000	285,000
Urban Gardening.....	3,000,000	-3,000,000	--
Non-point Pollution.....	702,000	-702,000	--
Food and Nutrition Education....	60,354,000	--	60,354,000
Pesticide Impact Assessment.....	1,850,000	-134,000	1,716,000
1890 Colleges and Tuskegee Institute.	12,241,000	+5,361,000	17,602,000
Renewable Resources Extension Act....	2,000,000	-2,000,000	--
D. C. Extension.....	983,000	--	983,000
Federal Admin. & Coordination.....	<u>6,321,000</u>	<u>-1,793,000</u>	<u>4,528,000</u>
		a/	
TOTAL AVAILABLE.....	<u>315,702,000</u>	<u>-3,791,000</u>	<u>311,911,000</u>

a/ Includes \$428,000 for the portion of Federal pay increases absorbed in FY 1982 necessary to carry out the programs in FY 1983.

PROJECT STATEMENT

Project	1981		1982 (estimated)		Increase or Decrease	1983 (estimate)	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
1. Payments to States:							
a. Smith-Lever Act:							
(1) Sections 3b & c:							
Program.....	\$185,595,624	172	\$198,114,880	158	-\$973,000	\$197,141,880	116
Set-aside for Federal Admin- istration (4%)..	4,486,000	--	5,043,120	--		5,043,120	--
Total.....	190,081,624	172	203,158,000	158	-973,000	202,185,000	116
Penalty mail....	15,300,000	--	16,218,000	--	+973,000	17,191,000	--
Subtotal, Sections 3b & c.....	205,381,624	172	219,376,000	158	- -	219,376,000	116
(2) Section 3(d):							
Program:							
Food and Nutri- tion (EFNEP)...	55,015,113	6	60,140,520	6	- -	60,140,520	6
Pest Management..	7,435,000	4	7,531,000	4	-464,000	7,067,000	4
Farm Safety.....	1,020,000	3	1,020,000	3	-1,020,000	- -	--
Pesticide Impact: Assessment.....	1,805,000	3	1,850,000	3	-134,000	1,716,000	3
Urban Gardening..	3,000,000	3	3,000,000	3	-3,000,000	- -	--
Energy.....	300,000	4	324,000	4	-39,000	285,000	4
Nonpoint source pollution.....	--	--	702,000	3	-702,000	- -	--
Set-aside for Federal Admin- istration (4%)..	--	--	213,480	--	- -	213,480	--
Subtotal, Section 3(d) .....	68,575,113	23	74,781,000	26	-5,359,000	69,422,000	17
Total, payments under the Smith-Lever Act...	273,956,737	195	294,157,000	184	-5,359,000 (1)	288,798,000	133
b. Payments under Renewable Re- sources Ext- ension Act.....	--		2,000,000	a/ --	-2,000,000 (2)	- -	--
c. Payments to the District of Columbia:							
Program.....	863,500	--	943,680	3	- -	943,680	3
Set-aside for Federal Admin- istration (4%)..	36,400	3	39,320	--	- -	39,320	--
Total, payments to the District of Columbia.....	899,900	3	983,000	3	- -	983,000	3

a/ Funds proposed for Rescission.



Project	1981		1982 (estimated)		Increase or Decrease	1983 (estimated)	
	Amount	Staff: Years	Amount	Staff: Years		Amount	Staff: Years
d. Payment to 1890 Colleges and Tuskegee Insti- tute: Program.....	10,800,000:	3	11,751,360:	3	+5,146,560	16,897,920	3
Set-aside for Federal Admin- istration (4%)..	450,000:	--	489,640:	--	+214,440	704,080	
Total, payments to 1890 Colleges and Tuskegee Institute..	11,250,000:	3	12,241,000:	3	+5,361,000 (3):	17,602,000	3
2. Higher Education Bankhead-Jones (Aid to Land-Grant Colleges).....	11,500,000:	--	--	--	--	--	
3. Federal Administra- tion and Coordina- tion (Direct Appro- priation).....	5,495,737:	12	6,321,000:	12	-1,793,000 (4):	4,528,000	8
Unobligated balance..	333,313:		--		--	--	
Total available or estimate.....	303,435,687:	213	315,702,000:	202	-3,791,000	311,911,000	147

Explanation of Program

Appropriations for the Extension Service enable the U. S. Department of Agriculture to perform its partnership role with State and local counterparts to carry out cooperative Extension Work for the benefit of our Nation's farmers and ranchers, and agricultural industries, rural and urban communities, families and youth, and the ultimate consumers of agricultural goods and services.

Cooperative Extension work is authorized under the Smith-Lever Act of 1914, as amended; the Rural Development Act of 1972, as amended; and the District of Columbia Public Postsecondary Education Reorganization Act. The National Agricultural Research, Extension and Teaching Policy Act Amendments of 1981 (Title XIV of the Agriculture and Food Act of 1981) also authorizes the Federal Government, States and Counties to implement cooperative Extension programs commensurate with needs stemming from changes in U.S. agricultural practices and the world food and agricultural situation.

The Extension Service, an agency in USDA, is a legislated partner in the cooperative effort with each State, the District of Columbia, Puerto Rico, Guam, the Virgin Islands, American Samoa, and Micronesia. The national staff provides leadership and coordinates the Extension program by:

- Serving as a liaison between USDA and the State Cooperative Extension Services, providing program leadership and assistance to the States in the conduct of Extension work.
- Administering Federal laws authorizing Extension work and coordinating the work among the States.
- Providing leadership for the educational phase of all programs under the jurisdiction of USDA.

The Federal Staff provides leadership to and coordinates the work of approximately 17,000 State, area, and County Cooperative Extension Service personnel (full-time equivalents) employed throughout the United States. Extension work in States and Counties is financed from Federal, State, County and local sources and is jointly planned with ES-USDA to provide educational programs adapted to local problems and conditions. Extension helps people identify and solve their farm, home, and community problems through use of research findings of the U.S. Department of Agriculture and the State Land-Grant colleges and universities.

JUSTIFICATION OF INCREASES AND DECREASES

- (1) A decrease of \$5,359,000 in funds designated for specific programs for payments to States for cooperative agricultural extension work under section 3 (d) the Smith-Lever Act consisting of:

- (a) A decrease of \$464,000 for the Integrated Pest Management Program (IPM) (\$7,531,000 available in FY 1982).

Need for Change. The nation's economic stabilization plan requires that Federal spending be curtailed. This particular proposal is possible because of the growth and success of IPM during the past several years. Economic returns of IPM programs to growers, development of additional educational materials, enhancement of interdisciplinary efforts and other program benefits are expected to continue at the proposed level of funding.

Nature of Change. A decrease in the rate of implementation of IPM programs into new commodities, into additional crop production and into more disciplinary sciences will result.

States which are able to utilize new or additional state or local funding and redistribute existing funding will be able to maintain programs at current levels. Other States may choose to reduce program efforts.

In some cases, partially developed programs may be turned over to private enterprises to meet producer demand for continuation of services initiated by Extension. Also, some Extension personnel leaving the State CES's have become successful providers of IPM services and thereby accelerate the transition to private enterprise.

- (b) A decrease of \$1,020,000 to eliminate earmarked funding for Farm Safety (\$1,020,000 available in FY 1982).

Need for Change. This proposal eliminates specifically earmarked funding for this program under section 3(d) of the Smith-Lever Act. The main purpose of providing earmarked funding is to focus attention on a specific problem that has national implications. The Department feels that this objective has been accomplished in the farm safety program. We believe that the essentiality of the farm safety program has been demonstrated since about one half of the States can continue to provide this type of assistance as part of their regular programs, even without this specific funding. In comparison, only 8 States were conducting this program prior to the initiation of this specific funding in 1975.

Nature of Change. This proposal will eliminate specifically earmarked funds for farm safety under section 3(d) of the Smith-Lever Act.

- (c) A decrease of \$134,000 for the National Agricultural Pesticide Impact Assessment Program (NAPIAP) (\$1,850,000 available in FY 1982).

Need for Change. This proposal is in line with this Administration's general reductions in government spending. At this level, the basic program will be maintained to meet the requirements of the 1972 amendments to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

Nature of Change. Emphasis will be directed to those pesticides undergoing review and litigation. Extension will have to rely more on information already available in lieu of obtaining additional information from surveys information from surveys and other sources.

- (d) A decrease of \$3,000,000 to eliminate the Urban Gardening Program (\$3,000,000 available in FY 1982).

Need for Change. The Urban Gardening Program currently being carried out in 16 cities was initiated in 1977 to demonstrate the benefits of home gardening in urban areas. This program was invaluable in teaching participants in cities the benefits of home gardening. For this reason, a large number of states have incorporated similar gardening information and assistance within their normal responsibilities through the Master Gardener programs. The Department believes that earmarked funding has accomplished the original goal of focusing attention on urban gardening.

Nature of Change. This proposal would eliminate specifically earmarked funds for this program under section 3(d) of the Smith-Lever Act.

- (e) A decrease of \$39,000 to reduce amount of specialist training and publications from the Energy Extension Program (\$324,000 available in FY 1982).

Need for Change. This proposal is in line with this Administration's general reductions in government spending. Because of increased efficiency this reduction is proposed.

Nature of Change. The amount available for training and publications will be reduced.

- (f) A decrease of \$702,000 to eliminate the Non-Point Source Pollution Program (\$702,000 available in FY 1982).

Need for Change. About one-third of the States have been conducting Extension education programs designed to reduce the impacts of non-point source pollution without the benefit of any earmarked funding.

Individual State Cooperative Extension Services at their discretion can conduct these programs from other funds available to them. In addition, State and County health departments are expected to continue to devise and implement regulations to assure proper construction and maintenance of individual waste disposal systems, assuring that inadequately treated effluent does not find its way into our waters. State water quality agencies, working in cooperation with the Environmental Protection Agency, also have the capability of devising and implementing the necessary regulations to abate non-point source pollution and the staffs to enforce such regulations.

Nature of Change. This proposal will eliminate specifically earmarked funds for the Non-Point Source Pollution program under section 3(d) of the Smith-Lever Act.



- (2) A decrease of \$2,000,000 to eliminate funding of Renewable Resources Extension Act (PL 95-306) (\$2,000,000 available in FY 1982).

Need for Change. Renewable resources educational programs have been conducted without earmarked funding in a number of States for some time. Earmarked funding for this educational program is not needed because the States have the option of conducting similar programs using other funds available to them.

Nature of Change. This is a new earmarked program in FY 1982. The \$2 million provided for its initial operation in FY 1982 is proposed for rescission and no separate specifically designated program is proposed for FY 1983.

- (3) An increase of \$5,361,000 in funds authorized under Section 1444 of the Food and Agriculture Act of 1977, as amended, for the 1890's Colleges and Tuskegee Institute (\$12,241,000 available in FY 1982).

Need for Change. Section 1431 of the Agriculture and Food Act of 1981 amends Section 1444 of the 1977 Farm Bill to provide for an increase in Federal funding of Extension programs at the 1890 Land-Grant colleges and Tuskegee Institute from the previous 4 percent of Smith-Lever appropriations to 6 percent in FY 1983. The increase recognizes the additional administrative responsibilities and increased complexity and scope of Extension programs at the 1890 institutions.

Nature of Change. These funds will enable the 1890 Land-Grant colleges and Tuskegee Institute to cover increased operating costs in their Extension programs and to provide for program expansion pursuant to Section 1431 of the Agriculture and Food Act of 1981.

- (4) A decrease of \$1,793,000 for Federal Administration and Coordination (direct appropriation) (\$6,321,000 available in FY 1982).

An increase of \$428,000 to restore pay increases absorbed in FY 1982.

A decrease of \$2,221,000 for Federal Administration and Coordination.

Need for Change. As the Federal partner, the Extension Service, USDA employs a national staff to coordinate Extension programs carried out by the Land-Grant institutions in the several States and territories. As a part of this Administration's drive towards a leaner government and in line with the economic recovery program for the country, certain aspects of the roles and functions formerly required of ES-USDA are proposed for termination or reduction in scope.

Nature of Change. Administrative, technical and other responsibilities to coordinate extension work and provide national leadership as required by the Smith-Lever Act and other legislative authorization will be maintained. However, the following functions may be conducted in a different manner: (1) development and demonstration of innovative programs and methodology; (2) program evaluation, approval and monitoring of formula fund activities; (3) support for science and education coordination including support for the Users Advisory Board (UAB) and Joint Council; (4) Federal response to individualized requests by States for technical assistance such as staff training, electronic technology, program reviews, etc.; (5) Federal involvement in the negotiation and management of pass-through funding from other USDA agencies and other Federal departments; (6) handling of correspondence and requests from general public; (7) program and administrative publications.



STATUS OF PROGRAM

Extension Service, the educational arm of the U.S. Department of Agriculture (USDA), through its partnership with Land Grant colleges and universities uses a nationwide educational delivery system to extend knowledge into virtually every County in the United States and its territories. This education is offcampus and informal--and recognized internationally as the most successful education system of this type ever developed.

This Extension partnership includes both the Land Grant universities that have been established in every State as a result of the Morrill Act of 1862 as well as the primarily black Land Grant institutions that were established in 16 States by the Second Morrill Act of 1890. Additional institutions that are members of the national Extension system include colleges and universities having similar goals and missions in the District of Columbia, Puerto Rico, Guam, Virgin Islands, American Samoa, Micronesia, plus Tuskegee Institute in Alabama. All of these institutions operate active Extension programs that form the national Extension system.

Memoranda of Agreement between USDA and the Nation's total Land Grant institutions undergird the State-Federal partnership. As the Federal partner, the Extension Service-USDA provides program leadership, program planning, and funds accounting for approximately 40 percent of the total dollars spent on Extension education. The remaining 60 percent of funds is provided from State, County, local sources, and private enterprise. The responsibility of the State partners, the State Cooperative Extension Services, is to carry out Extension's multifaceted educational program in a wide variety of "grassroots" settings.

The Extension network utilizes diverse delivery methods and flexible staffing patterns to develop and adapt program content to reach out and respond to high priority local needs and interests in a way that incorporates responsiveness to relevant broader national USDA priorities and concerns.

The basic premise of Extension educational programs is that human progress can be enhanced when the products of research are translated into readily understandable language and made widely available to individuals, along with the assistance needed to develop higher quality decisionmaking for appropriate analysis and application of factual information. The key to Extension's success is its unique structure as a partnership of Federal, State and local governments with strong guidance in its priorities from those it serves. Extension staff members live and work among the people they serve and thereby foster close local ties and stimulate and educate people to plan ahead and cope with their problems. The more than one million volunteers, who greatly multiply the impact of the Extension professional staff and help extend Extension's program scope and influence, also represent forceful, locally respected advocates for the Extension system of "helping people to help themselves." Who are the people served? Farmers, ranchers, businessmen, families, homemakers, youth, community leaders, and others who seek Extension assistance.

Extension's program delivery methods range from highly individualized one-to-one consultation and tutoring to Extension's use of mass media for contacts with the general public. Selection of specific methods depends on the educational problem encountered. For example, in highly technical areas such as crop pest control, onsite inspection may be required for satisfactory problem analysis and recommendation. However, the one-to-one approach may also be the best way to motivate a farmer who is barely at the subsistence level to adopt better agricultural practices to make that particular farming operation viable or to insure improved family nutrition with low-income homemakers. And as excellent as the mass media are for reaching large numbers of people with general information, this method is much more effective in creating awareness and stimulating interest than in fostering adoption.



Most program delivery methods have broad application, but need careful tailoring to be effective in specific situations. For instance: there are more than 550,000 volunteers who advise and lead 4-H groups and help with individual projects; over 100,000 junior leaders (older 4-H'ers) who assist them; over half a million volunteer leaders trained by Extension home economists to arrange and conduct educational programs for local homemakers and families; voluntary groups which spearhead efforts for community development projects; the many farmers and ranchers who permit their operations to be used for agricultural and management demonstrations, and then open them for educational tours; and many master gardeners and others representing groups--all needing different kinds and amounts of leadership training and support from Extension professionals, at the same time as they as volunteers multiply Extension's resources and capabilities many times.

Extension programs are crosscutting. The expertise represented by the various disciplines integral to Extension are widely used to support each other's program needs. For example, energy specialists suggest improvements in utilization efficiency for farms, homes, community buildings, and small businesses. Crosscutting can also be expressed in the linkages Extension makes with other agencies and organizations having shared responsibility and interests in certain program areas.

Extension works closely with a host of cooperating Federal agencies. Many of these--such as the Forest Service, Food and Nutrition Service, Farmers Home Administration, and Soil Conservation Service--come from within the U.S. Department of Agriculture. Many others of a wide-ranging diversity come from outside USDA. Examples include the Department of Energy, Bureau of Indian Affairs, Environmental Protection Agency, Fish and Wildlife Service, and National Sea Grant College Program. The diversity illustrates well the broad applicability of the Extension educational system to many diverse subjects and programs. In a number of instances, the cooperation involves provision of pass-through funding to Extension from the cooperating agency, thereby reducing duplication and getting the educational job of technology transfer and adoption done in a cost-effective and most successful way.

Extension's practical, down-to-earth approach to solving everyday problems frequently belies its sophistication. The challenge to be results-effective, process-effective, involvement-effective and cost-effective, is ever-present--internally driven as much as externally imposed. Of great current interest is the increased utilization of computer technology to assist program delivery. Extension already has considerable experience in helping farmers, ranchers, and small businessmen to use programmable calculators to advantage. Several agricultural weather and market information networks, such as AGNET and EXTTEL, are in routine use by Extension clients in many States. Other computer programs are designed to help users "walk-through" the decision process in farm management, family financial management and budgeting, human and animal nutritional analysis, energy management, and community grant-funding sources.

A pervasive but often unrecognized benefit from participation in Extension programs is the development of leadership abilities among clientele. In Extension's close, collaborative working relationship with people at the "grassroots" level in designing educational programs suitable for the targeted audiences, the people are encouraged, prompted, and assisted in every appropriate way to articulate their needs and interests. They are also supported in developing their ability to become constructively critical, mentally stretched to develop an eye for seeing alternative solutions to complex problems, and coached in assessing and accessing the local political-economic-social milieu to effect positive change in their own behalf. Many hesitant, fledgling Extension advisory committee members, volunteer leaders and teachers, 4-H'ers, homemaker club members, and community interest project participants are helped to emerge into fully competent, confident leaders in local government, professional and social organizations--as well as in their chosen career fields.



The Extension Service-USDA/State Cooperative Extension Service partnership has clearly demonstrated the capacity to adjust its programs as the problems of agriculture and rural families and communities change, and to contribute to solving urban problems as well. In making decisions on program priorities, Extension relies on guidance from those who seek and need information. As a voluntary educational program Extension can only succeed when it is in consonance with such needs. Extension prides itself on being a piece of the government which never left the people. Since 1914, Extension has been contributing vigorously to maintaining a "self-help society."

Educational programs address National, State, and local concerns consistent with Extension's mission and priorities. Ongoing broad Extension program thrusts include increasing productivity, conserving resources, improving marketing, developing management capabilities, enhancing health and quality of life, and assuring economic security and stability. These thrusts are described in the six sections of Part I that follow this introduction. The six program thrusts cut across and involve all of the traditional Extension program areas. For reference, the distribution of Extension professional staff effort nationally among these traditional areas in FY 80 was: Agriculture, 38.8 percent; 4-H and youth, 27.7 percent; Home Economics, 22.2 percent; Community and Rural Development, 7.6 percent; and Natural Resources, 3.7 percent.

Part II provides descriptions of those special, targeted Extension program efforts for which earmarked funds have been made available: integrated pest management, pesticide impact assessment, farm safety, urban gardening, non-point source pollution, energy centers, Expanded Food and Nutrition Education Program (EFNEP), and Renewable Resources Extension Act (RREA) activities.

PART I

DESCRIPTION OF BASE PROGRAM  
PRIMARILY FUNDED FROM THE SMITH-LEVER 3(b) and 3 (c),  
1890 and TUSKEGEE, AND DISTRICT OF COLUMBIA EXTENSION APPROPRIATIONS

SECTION 1--INCREASING PRODUCTIVITY

Current Activities:

Increasing productivity means assuring an adequate supply of wholesome food and fiber at prices reasonable to consumers and competitive in foreign markets. It means providing a sufficient return to producers to give them an incentive to come back next year and produce more. Increasing productivity means families coping with inflation by growing and preserving some of their own food, by doing simple home repairs for maintenance and energy conservation. It means developing skills and crafts that enable families to increase their household productivity. It means involving youth in educational programs that assist them in acquiring the knowledge, developing the life skills and forming the attitudes to enable them to become self-directing, productive and contributing members of society for the rest of their lives. Increasing productivity means working with rural communities and their local governments and small business to help them develop leadership skills, and to help them improve their managerial abilities so they can be more productive and efficient. It means reducing soil erosion and soil salinity to protect the productive capability of our Nation's soil.

Selected Examples of Recent Progress:

Working with commodity-industry groups, Extension is providing a means for updating and identifying current, multidisciplinary educational programs for agricultural producers. In wheat and soybeans, for example, there are wheat and soybean-industry resource committees made up of Extension specialists and producers. Together they identify national and regional educational needs of producers. They also recommend and develop educational materials to assist producers who face problems related to the production and marketing of their commodities. Extension industry committees are providing a forum to communicate nationally the concerns, issues, and needs for additional educational emphasis in these areas.

Cotton is still king in Mississippi. In FY 81, Mississippi cotton averaged 618 pounds of lint per acre for a total value of more than \$600 million. The Rankin County Extension Service operated a cotton insect control program during the 1981 growing season. They hired one full-time and one part-time pest management scout to check 4,000 acres of cotton for 11 producers. The average cost per acre for insect control for the 1981 season was \$25. In 1980, without the scout program, insect control costs averaged \$48 per acre.

In Monroe County, Mississippi, four Extension-trained scouts checked more than 5,000 acres of cotton for 3 months for three producers. High numbers of boll weevils were found early in the season and growers were advised to apply chemicals to their cotton when the squares were the size of pinheads. This single application delayed the start of boll weevil control for 3 to 4 weeks at a savings of about \$30,000. It is estimated that the money saved in Monroe County in insecticide applications made and in increased yields amounted to \$500,000 for 1981. Mississippi Extension is going to recommend the "pinhead" chemical application to all its growers for the 1982 season.

In Oregon, 20 sheep producers participated in a demonstration with Oregon Extension Service to show the effectiveness of electric anti-coyote fencing to reduce sheep losses to coyotes and dogs. Prior to the demonstration, losses averaged 22 percent annually. After the fencing was completed, losses dropped to an average of 0.6 percent. Estimated savings amounted to \$7,000 per rancher. The fencing also permitted producers to increase their flock sizes from an average of 160 sheep to 312.

A sawmill operator in Minnesota reported a first month's savings of \$1,800 after attending a sawmill clinic. He and nearly 400 other participants were shown how to increase their productivity through a more efficient sawmill operation. An operator who reduced oversizing and inaccurate sawing by only 3/32" on each cut can increase his yield about 6 percent. This can increase a small sawmill operator's income by as much as \$4,800 per year. It also means more lumber is produced from the same amount of timber.

Of the 25 States that have been designated pullorum-typhoid clean, the Extension Services in four of them (South Carolina, South Dakota, Mississippi, and Iowa) have had the lead in cooperating with USDA in this effort. All States participating in the program are using Extension educational materials to keep poultry farmers abreast of the latest techniques in detecting and controlling these serious diseases. Another six State Extension Services (Kentucky, Kansas, Idaho, Arizona, Wyoming, and New Mexico) have the lead in working to get their States declared pullorum-typhoid clean.

More than one million copies of Extension publications on home repair and maintenance have been requested by individuals and Federal agencies (e.g., Farmers Home Administration and Department of Housing and Urban Development over 100,000 each). In Arkansas, through "Fix-It" short courses conducted in 27 Counties, 1,053 leaders were taught maintenance skills: 40 percent reported conducting intensive check-ups, 65 percent made repairs, 50 percent reported making repairs valued at \$60 per unit (\$31,560), and, in addition, these leaders taught skills to 3,682 other individuals.

Nationally, more than 1.3 million youth were enrolled in animal and poultry 4-H projects. Livestock production continues as an important industry in Utah. In 1980, more than 8,000 youth produced nearly \$2 million worth of livestock through the Utah 4-H livestock project. Through this program, the youth are gaining an understanding of animal science production technology, exploring potential careers, and learning a lesson in personal responsibility through the care and feeding of their animals. Utah had a 20 percent increase in 4-H livestock projects during 1980.

Indiana, in concert with ES-USDA, has a multi-State, multidisciplinary project to develop a comprehensive recordkeeping system for pork producers. The National Pork Producers Council is cooperating with Indiana Extension in this project, and together they are developing a model that will accommodate production, performance, business, and other records of pork producers regardless of the size of operation or recordkeeping methods used. This system, which can be computerized, will ultimately provide pork producers with a recordkeeping system similar to that of the Dairy Herd Improvement Association program.

Feed costs are the largest cash expense on a dairy farm. Computer programs are being effectively used to develop nutritionally adequate, least-cost feeding programs for use by dairy farmers. For a 60-cow herd, reducing feed costs 5 cents per cow per day results in an annual feed-cost reduction of



\$1,095. This represents a potential savings of \$16-17 million in feed costs per year for New York dairy farmers alone. Programmable calculators are also being used in New York and other States to balance dairy rations with more accuracy and with substantially more efficient use of staff time.

Alaska's leading industries are oil and gas, fishing, lumbering, and furs. Now, the State Rural Development Council, of which Extension is a member, has taken steps to develop agriculture. A proposed Council policy includes bringing a minimum of 500,000 acres into cultivation by 1990. Already, pioneering farmers in the Delta Agricultural Project have made a start toward that goal with 53,000 acres cleared and 11,000 acres planted to crops, mostly barley.

An example of a special Extension project that operates with pass-through funding from the Environmental Protection Agency (EPA) is the Pesticide Application Training (PAT) program which has as its goal, the training of all farmers, ranchers, and commercial users of certain pesticides designated by EPA as restricted. These pesticide users have spent several hours in Extension classrooms where they were instructed in the safe use of pesticides. In some States, home study courses have been used so the farmer or rancher could study at a convenient time. Following the training, the applicators are certified, usually by a State agency such as the State department of agriculture. Nearly 2 million private and commercial pesticide applicators have been trained and about 1.5 million of these have been certified. PAT has created an awareness among farmers, Extension personnel, State departments of agriculture, and the public about the principles of and the importance of safe pesticide use and pesticide regulations. A survey by an independent firm of five States--Iowa, Nebraska, Georgia, New York, and Pennsylvania--found that "pesticide applicator training programs have had a substantial positive impact on the growers' awareness about the personal and environmental safety issues related to the use and handling of pesticides." The study also showed that "the training program makes farmers aware of the dangers of using pesticides, (and) teaches them the correct use of pesticides."

Nearly 3,000 Nebraska farmers have been encouraged to use irrigation scheduling through short courses, workshops, and Extension demonstrations held on farms in 85 of Nebraska's 91 counties. During 1980, some form of irrigation scheduling was practiced on 1.6 million acres with an average savings of 7.3 inches of water per acre. Consequently, about \$12 million worth of nitrogen fertilizer and \$36 million worth of energy were saved. If the 6.5 million acres of Nebraska farm land that need irrigation had used irrigation scheduling, the savings in energy alone would amount to 18.5 gallons of diesel fuel per acre or 120.2 million gallons annually.

## SECTION 2--CONSERVING RESOURCES

### Current Activities:

Extension programs demonstrate the financial and other long-term benefits of conservation. Conservation means protecting and using resources wisely, as well as developing and using alternative resources. Extension programs help users conserve and develop energy, soil and water, forest, wildlife, marine, and other resources. Both the user and the Nation benefit. Almost everyone uses energy and other resources, and everyone can help conserve them. Educational programs reach many resource users through Extension's County and mass media delivery systems. Extension also reaches special audiences such as resource managers, businesses, dependent poor, and communities, as well as families, farmers, and youth--each of which fills a special place in the total rural economy and society.



Homes use less of the Nation's scarce energy resources when they are winterized, insulated, heated with wood, and protected by windbreaks. Energy audits show how much energy is being lost, and from where. Individuals also use less energy when they select energy-saving appliances, dress warmly, turn down their thermostats, and realize how much they can save by doing so. The 15 million people reached by Extension in FY 80 saved 200 million energy dollars per month. Farmers and ranchers use less energy through adopting minimum or non-tillage farming, selecting alternative fuels, maintaining equipment, and using solar energy for crop drying and other uses.

Communities and individuals conserve and protect other resources such as soil and water, forests, wildlife, farmland, shoreline, minerals, and marine resources. Farmers adopt minimum or no-tillage farming not only to save energy but also to protect the long-term productivity of the soil, which also helps reduce water pollution. Forests protect the soil and regulate runoff as well as producing wood and other forest products and services. Wildlife adds to the quality of life and also provides hunting opportunities. Land which is preserved for farm use rather than being withdrawn assures continued agricultural crops. Shorelines often need protection to continue to serve as a valuable resource. Marine resources are often fragile, and have tremendous unrealized potential. Lands can be mined, and mined land can be reclaimed in a way that gives consideration to future values.

#### Selected Examples of Recent Progress:

Extension on-farm demonstrations have shown farmers in Maryland, Florida, South Carolina, Tennessee, Virginia, Illinois, Missouri, Kansas, and Michigan how to use solar energy to dry corn, wheat, tobacco, fruits, soybeans, hay, and peanuts. Nine States are participating in a special project to develop techniques for using solar energy to heat livestock structures for swine, poultry, and dairy animals. Many farmers are picking up ideas to use on their own farms through Extension tours or from the several farm magazines which have devoted full-length feature articles to this project, now in its 2nd year. States participating are Vermont, Virginia, Ohio, Illinois, Minnesota, Iowa, Missouri, Nebraska, and Kansas.

Three wood companies, a textile plant and a public school in North Carolina converted to wood as a fuel as a result of Extension educational programs. These companies are using wood to replace the equivalent of approximately eight million gallons of oil a year. This represents a savings of approximately \$5.5 million in fuel costs (based on 1980 oil and wood costs). However, as the use of wood as a home fuel has grown nationally, so has the frequency of wood-stove-caused home fires. A Louisiana Extension program which emphasized the use of wood as an alternative fuel, safety, and the relative energy efficiency of wood heating equipment reached 7,000 families. The largest insurance company in upper Michigan credits an intensive Extension educational campaign with the reduction of home fire claims by 50 percent in the past year. The combination of prime-time mass media (designed to reach persons from 18-49 years old) and group meetings were directed at wood stove safety for the home.

Conservation tillage is catching on fast in the U.S. thanks to a concerted effort by the Extension Service. In 1980, conservation tillage saved Iowa farmers an average of \$1,400 per farm and Nebraska conservation-tillage farmers increased their corn and soybean yields in nonirrigated fields by 25 percent. The Iowa Extension Service found that one series of meetings and tours in the Spencer area during 1979-80, resulted in a savings of 456,000 gallons of fuel. This savings cut production costs by \$1.45 million and increased corn and soybean yields. According to the survey, 47 percent of the

300 farmers who responded said they had changed tillage practices with soybeans when planted following corn as a result of Extension's educational program. The farmers also reported saving fuel, reducing operating costs, and increasing soybean yields. They also left more crop residue on the surface to help prevent soil erosion.

One-third of the 50,000 people who attended 500 Extension sponsored group meetings in Connecticut added insulation, and 29 percent installed storm doors and windows. In Vermont, an Extension home energy audit program which began in six counties has been extended Statewide. Of the first 3,600 audits, 85 percent of those audited said they had or were going to make improvements to their homes to save energy.

More than 26,700 Tennessee youth participated in the 4-H school program in wildlife. Many subsequently competed in wildlife and fisheries judging contests and wildlife food and cover establishment contests in which wildlife food plots are established and records kept; the 4-H forestry judging contests have expanded from 50 Counties to 80 in 1980.

Energy has become the second highest cost item in most local government budgets, trailing only personnel costs. Police cars and garbage trucks use the most fuel. An Extension agent in Oklahoma has developed guidelines and a workbook for converting vehicle fleets to compressed natural gas. The workbook tells how to calculate costs and savings from conversion. Working with the agent, the city of Stillwater converted 25 municipal vehicles to compressed natural gas and expects to save \$400,000 in 5 years.

A new windbreak-planting handbook and a mass media campaign stimulated farmers and ranchers in 30 western Oklahoma counties to triple the number of trees planted. This additional protection will save home energy; protect crops, livestock, and buildings; add to land values; and seek to assure that there will be no future dust bowls in this area.

Lignite mining in Texas will disturb one to two million acres of land. An Extension educational program for professional foresters, mining engineers, agronomists, and other resource professionals provided the latest information on reclamation so that plans can be developed to minimize the impact, and recover from it as quickly as possible. Also, a decision to convert 2,000 acres of farmland to other use was reversed through the efforts of Texas County agents, working with other USDA agencies. Their success provides a model for dealing with future proposed farmland withdrawals, and strengthens soil and water conservation by preserving highly productive farmlands for future generations.

### SECTION 3--IMPROVING MARKETING

#### Current Activities:

Improving opportunities and alternatives for marketing of agricultural and home products continues to be an area of need and interest. Extension educational programs encourage producers to assume more responsibility in identifying various market opportunities, and to analyze the economic considerations for different alternatives. Marketing large quantities of agricultural products becomes more sophisticated and technical, and requires a greater level of knowledge on the producers' part to bring about productive sales of their products.

In recent times, new markets have been found for fresh fruits and vegetables in community farmers' markets. They have been popular from the consumer's point of view, in that fresh produce can be obtained at reasonable prices. In addition to the financial considerations of farmers' markets, Extension training has increased understanding between the producer and the consumer regarding the nature of producing quality products and also helped the producer understand the consumers' points of view.

In addition to improving marketing of food and agriculture products, Extension programs assist businesses and individuals to improve their marketing skills. This is particularly important with products in which there are poorly developed markets, such as timber and crawfish. A potential seller often knows little about timber. Selling may be a once-in-a-lifetime transaction. Extension provides information on where to go for assistance; how to mark, measure, identify, scale, and sell timber; how to grade logs; how to safely and efficiently harvest, saw, dry, process, and sell wood products; how to produce and market Christmas trees; and how to produce and market maple products. The aquaculture industry is new and growing rapidly. Growers receive much information from Extension about how to grow, protect, harvest, process, and market aquacultural products, such as crawfish and catfish. Similar Extension programs reach families who seek to earn income through home-based enterprises.

Community Resource Development programs have contributed to improved marketing through helping communities understand local market opportunities and the resulting economic stimulation occurring from community markets. Extension education that reaches the adult family members in the home and on the farm also reaches youth to assist them in gaining skills and understanding the marketing process.

#### Selected Examples of Recent Progress:

In 1980, Senate Resolution 225 was passed. It requested the Secretary of Agriculture to expand educational programs to help producers of agricultural commodities better understand their marketing alternatives. A survey of Extension and other educational programs on marketing alternatives was made. Preliminary figures indicate that in 1981, more than 20,000 farmers participated in Extension workshops on futures trading. Workshops were also held on other marketing alternatives such as forward contracting, storage for later sale, and selling at harvest.

In Connecticut cooperative efforts between Hartford Extension 4-H, the Connecticut Farmers Market, Connecticut Public Interest Group and the Hartford Food System marketed produce from eight inner-city youth garden plots. Evaluation of the Hartford program indicates that youth learned much from the program, including valuable lessons in nutrition and human health. Over \$700 of vegetables and ornamentals were marketed at the 4-H Farm in Bloomfield by 15 teens who worked on a profit-sharing program. Youth also gained experience as salespeople at a farm store on the 4-H Farm.

In 1980, the District of Columbia Extension Service helped establish a "D.C. Open Air Farmers Market" at the D.C. Stadium parking lot. This past season, participation averaged 6,000 customers per day, with a peak day of nearly 10,000. Prices for fresh fruits and vegetables averaged 20-30 percent below the major food stores in the metropolitan area. About 31 farmers from within a 150-mile radius of Washington grossed \$500-1,000 each day with some of the larger operators grossing as much as \$3,000.



Marketable crafts provide opportunities for many to expand family income. Corporations in Massachusetts, New York, and Virginia contacted West Virginia Extension staff to locate local quilters. Subsequently, one person earned sufficient money in 1 year to install plumbing in her home and another reported earnings of \$500 in a 12-month period. An estimated \$50,000 was earned by 30 quilters to supplement family incomes. In Arkansas, a County craft fair attracted 60,000 people and netted \$57,000. A Tennessee Extension survey revealed that 743 out of 2,690 homemakers had sold arts and crafts - to increase their annual income up to \$1,000 or more.

The Texas Agricultural Extension Service has been asked to assist producers to market live crawfish for table-use. The present demand is increasing rapidly. Processing will open new vistas for producers. Production per acre has increased over 15 percent in the past 3 years. In Louisiana, crawfish production has been viewed as an alternative crop with rice and soybeans to provide an additional source of income. Extension training in production techniques has contributed to the 5,000-acre-per-year increase in the crawfish industry, currently valued at \$10 million.

#### SECTION 4--DEVELOPING MANAGEMENT CAPABILITIES

##### Current Activities:

Everyone manages something--starting with personal affairs and extending, to one degree or another, through households, farms, businesses and communities. In these persistently inflationary times, it becomes of paramount importance for individuals and groups to maximize returns on financial and other resources--to try to do more with less.

Extension is applying a wide range of educational methodologies and techniques in order to develop management capabilities. Approaches include computerized budgeting, multi-State councils, "hands-on" laboratory demonstrations, outreach and counseling, to mention only a few. These are being applied to a broad range of management problems--money management; food buying and other consumer economics; wildlife resource management; farm management; energy management; and use of capital and credit. Although the clientele have different problems, all are seeking to do jobs in time- and cost-effective ways. Major clientele groups include homemakers (both full-time and employed), farmers, sportsmen, business people, plant managers, community leaders, and 4-H youth who will become future managers. The objective of such Extension education is improved management capabilities so people can deal intelligently with such overriding issues as rapidly increasing energy costs, inflation, unemployment, declining investment opportunities, a shrinking tax base, community growth patterns, and overall questions of resource allocation and use.

##### Selected Examples of Recent Progress:

Many farmers face extremely serious cash flow and financial management problems stemming from high interest rates, rising costs of production and low farm prices. In some areas, this situation has been aggravated by adverse weather.

An increasing number of financial management computer techniques are being developed and made available to lenders and farmers. Also, specific training in the use of these techniques is provided the lenders. For example the Minnesota Cooperative Extension Service has a pilot project financed by the Farmers Home Administration in using computer techniques to evaluate

applications for farm loans. A national survey of computer programs in Extension was recently completed. It shows there are 1,000 computer programs in present use by the State Cooperative Extension Services.

A Missouri Extension pilot project offered in shopping malls reached 161 people with programs in computer-assisted money management and budgeting. A followup survey 4 months later showed 80 percent had changed their attitude about budgeting and 70 percent were taking some key steps to control spending. Arkansas Extension held 43 training sessions on financial management for 673 volunteers who then in turn put on nearly 60 general meetings, attended by 1,732 people. The participants indicated they later saved \$17-20 each in their next month's buying period. This translates into a total of \$31,000 saved per month and \$372,000 for the year.

The Delta Wildlife Council is comprised of 75 hunting and fishery clubs with more than 4,000 members who lease or own more than 200,000 acres in the delta areas of Mississippi, Arkansas, Louisiana, and Tennessee. The Council was formed as a result of educational efforts of Mississippi Extension and is the mechanism for disseminating the latest wildlife research to sportsmen and encouraging hunters and fishermen to manage wildlife resources in the delta wisely. One project, the "Quality Deer--Trophy Management Program," has attracted national attention through outdoor magazines such as Outdoor Life, Alabama Game and Fish, Mid-South Sportsman and other publications. Cooperating organizations include the Corps of Engineers, Soil Conservation Service, Mississippi Department of Wildlife Conservation, Mississippi Agricultural Experiment Station and private timber companies.

In New York, more wood is used for energy than for all other uses combined. In Michigan, the value of wood used for energy is almost equal to the value of corn, which is the leading agricultural crop. In both States, Extension conducts woodlot management workshops emphasizing safe and efficient harvesting of firewood to increase the value of the remaining trees and recognizing that it is false economy to use future crop trees for fuel if they have more value for other uses.

Extension Services in Virginia, South Carolina, Alabama, North Carolina, Tennessee, and Texas, in cooperation with the Forest Service (FS), provide kiln drying training to industry personnel from throughout the United States. Training provides kiln operators and supervisory personnel, lumbermen, and wood users with basic information and up-to-date techniques to reduce drying defects, energy usage and handling costs. The regional program involves eight Extension wood products specialists, two FS specialists and three dry kiln manufacturing company engineers. Students receive classroom and lab training to learn how to dry lumber, reducing defects and costs which thereby increase company profits by 15 to 25 percent.

Interest in finding ways to cope with inflation is reflected by the increased number of youth participating in Extension resource management and consumer economics projects; nationally, more than 130,000 young people are participating in projects of this type. In Louisiana, enrollment in such courses was up 23 percent from one year to the next. Young people learn such skills as judging quality in clothes; selecting energy-efficient appliances; and understanding credit, savings, guarantees, and contracts.

Ninety-five percent or more of all businesses in many States fall into the small business category. The success and viability of these small businesses scattered throughout our Nation's smaller communities and rural areas are critical to the economic well-being of our overall rural and agricultural economy. A sobering statistic, however, is that 50 percent of small businesses fail in their first year; and 80 percent in the first 2 years. The

Wisconsin Extension business management program offered 688 programs on business subjects for the improvement of management skills, reaching more than 25,000 business people. Also, 812 small businesses were reached with individual management assistance counseling. The counseling got high marks: 95 percent of the clients thought it was helpful or very helpful; and 89 percent made changes in their operations as a result of the help. Utah Extension's Small Business Development Center provides information, referral, education, and consulting services in order to help reduce business failures. The Center has prevented at least three bankruptcies and has had potential, preventive impact on six businesses. Arkansas Extension and the Small Business Administration (SBA) have teamed up to start a Small Business Outreach Project. The program is designed to increase the dissemination of information about assistance available to small businesses in rural areas and to increase capital investment through loan guarantee programs. The Little Rock district office of SBA has tripled its loan volume since the program started, from \$1 million to \$3 million. Twenty-three banks have been enlisted to learn how to cooperate in SBA loan activities.

Working with three ranches near Pegasus, Idaho, an Extension beef management program helped cut death losses in young calves from a high of 22 percent to less than 3 percent over a 3 year period resulting in savings of over \$2.5 million. To disseminate results Extension conducted meetings to explain the project to interested ranchers. Management changes and calving techniques applied included improved calving facilities, sanitation and nutrition, treatment of sick calves, closer observation during calving, and herd vaccination. Of the 90 attendees it is estimated that 50 will adopt new practices. This will multiply savings over 3 years to an estimated \$126 million.

#### SECTION 5--ENHANCING HEALTH AND QUALITY OF LIFE

##### Current Activities:

The ultimate measure of quality of living is the kind of human being produced. The nature of the person determines the character of society and of future generations. Quality of living encompasses the sum total of all experiences of the individual. It has material aspects, since all people have primary need for food, clothing, housing, and a measure of security. It also includes social and psychological aspects as well.

One of Cooperative Extension's greatest strengths has been its recognition of the home and family as an economic unit that profoundly affects all the other socio-economic aspects of our society. From birth, the individual's home environment sets the person's life pattern. The experiences with family, friends, schools, the contacts with the economic and political system--all these determine the person's views of society and that individual's place in it. Objectives of quality-of-living programs call for Extension to: enhance the quality of individual and family decisions and provide the skills to carry them out; increase the ability of the individual to interact effectively with others; help people to learn to use community services and take part in developing them; and improve the social, economic, and geographic mobility of the individual.

Good health is one of the most precious resources a person can have. The state of an individual's health affects his or her whole being, which in turn affects those around that person, who then influence others. This cascading effect indicates how a single person affects society. Therefore, the major priority for family health is to recognize and utilize preventive health care measures throughout the life cycle to enable each individual to attain maximum potential and thus benefit society and community. Nutrition is one of the largest factors affecting the health of every individual from the time of conception to death. More than half of the Extension Home Economics professional and paraprofessional time is expended in this area.



Extension staffs in every County and State are recognized as authoritative sources of human nutrition information. In many areas of the country, the local Extension office is the only source of research-based information related to human nutrition. This information allows people to make informed decisions on how to maintain good health and how to do so in a cost-effective manner in order to combat the pressures of inflation.

The National Extension Homemakers Council represents almost 500,000 members in the United States, Puerto Rico, and the Virgin Islands. This organization of volunteer leaders trained by Extension Home Economists supports and extends the benefits of Cooperative Extension Service educational programs to more than 75 million contacts annually. Extension Homemakers contributed over 30 million hours of volunteer service to families and communities across the Nation in 1980. The volunteer service has a monetary value of over \$135 million. The Extension Homemakers organization's educational programs provide its members opportunities to apply new skills, gain knowledge, and improve practices within the home and family. One-third of the members have learned skills which have increased the family income either from self-employment or from employment outside the home.

#### Selected Examples of Recent Progress:

An evaluation of an eight-part fact sheet series developed by New York Extension provided the following results: half the people returning the mailed survey reported making a personal dietary change such as increasing fiber consumption or decreasing consumption of fats or sugar; and half reported making a change involving their family members or neighbors. Seventy-three Kansas Extension home economists who received special training in nutrition in relation to health trained 1,290 volunteer leaders who in turn are training Extension Homemakers and other groups.

Alabama Extension's nutrition and physical resource program, "Fitness 7," enabled 2,984 Alabamians to evaluate their lifestyles relating to nutrition, exercise, weight, and alcohol; so far, 724 have made some behavioral change for a more healthful lifestyle. More than 1,600 people participated in an 11-week Georgia Extension series on weight control. The average weight loss was 9.8 pounds for women and 15.7 pounds for men. Obesity is the most widespread nutritional problem in the United States. Proper weight control and maintenance is a blend of reliable knowledge, adoption of good food habits, and incorporation of healthful daily activity patterns into a chosen lifestyle.

Nebraska Extension has developed DIETCHECK, a telephone-accessible computerized program which analyzes up to 14 days of calorie and nutrients dietary intake. In FY 81, 24,092 programs were run nationwide; users were State Extension Services of Nebraska, Montana, North Dakota, South Dakota, Wyoming, and Washington, as well as public schools, homemakers, the university football team, university students for research purposes, weight-control organizations, hospitals, and State health departments. "Nutri-Fit," a Colorado Extension computerized diet and activity analysis program is being used in 11 States.

Maternal and infant nutrition is a vital health issue affecting women and children of all socio-economic levels. It is generally accepted by health professionals that a woman who is well nourished prior to conception and during pregnancy will probably have an uncomplicated pregnancy and a healthy infant. In a recent national survey, Extension Service-USDA found that 80 percent of the States provided nutrition education programs to women with children. Seventy percent of these indicated that breast feeding information was learned as part of the program. Special efforts have been made to reach families of different ethnic and cultural backgrounds. Several State Extension Services report working with migrant families. Colorado developed

an educational packet on infant feeding for Native Americans. Over 300 prenatal and postnatal Asian refugee families in Oregon have been served since 1980. Many of these families had children who failed to gain as expected in height and weight, resulting in poor growth and development. These families have been taught to feed their children properly, utilizing both native and local foods. As a consequence, the children have gained weight and are growing well.

National enrollment in 4-H health and personal development projects amounted to more than 670,000 young people. Oregon Extension reports that Lane County schools include 4-H/EFNEP materials as part of the science curriculum in the 1st through 6th grades. The program involved 8,301 children from limited income areas, a 233 percent increase over the previous year. Teachers are reported to enthusiastically support the program, 90 percent describe EFNEP as an effective way of teaching basic nutrition, and 35 percent report noticeable changes in the children's eating habits. Also, over 300,000 4-H'ers participated in health projects last year. Educational programs included dangers of smoking, physical fitness, stress, dental hygiene, drug abuse, first aid techniques, family communications, and parent-teenage relationships.

Home gardening and food preservation are continuing to interest people as means to improve family nutrition and to save money. Food spoilage of home canned and frozen foods continues to be a widespread problem. To disseminate proper food preservation techniques, Mississippi Extension home economists conducted 285 workshops with 9,429 persons attending. In addition, State and County Extension staff reached 6,844 people with food preservation information through yard and garden clinics conducted in four cities. Food preservation information was also provided through TV programs, radio programs, newspapers, and newsletters. Average savings for a family of four are estimated at \$520 per year. In Kansas, over 6,000 people received training or attended Extension meetings on preservation and safety, and over 100,000 phone inquiries were answered.

Many farm women regularly operate farm equipment; others are part-time workers during seasonal peaks. Most have very limited experience and get little training before being put in charge of a machine. Minnesota Extension developed a program to teach fundamental machine functions and controls, and to promote strong on-farm safety programs.

Extension is responding to requests for assistance from families in coping with the many changes that are taking place today: the rise in single-parent situations, two-wage-earner families, and increasing numbers of people living alone. About 160 families in 10 urban and suburban neighborhoods in Syracuse are taking part in a New York Extension in-depth educational activity called "The Family Matters Program," designed for parents with children entering first grade. Besides helping parents to be better "teachers" of their children, the New York program is encouraging parents to volunteer for work in school classrooms. A Tennessee Extension Home Demonstration Club reading program has 7,504 participants in 70 Counties. The idea is to get families to improve family relations by reading together. Nearly 4,500 of the participants reported making changes in their lives because of the activity.

Communities, large and small, all over this Nation are struggling in today's economy to provide necessary services for families and individuals. Extension volunteers play a vital helping role in many States. An Arizona Extension Homemakers club raised money, over a 10-year period, for a new school and community center through fund-raising projects, donations and volunteer labor. Another Homemakers club organized a community into action to create a new, professional medical health care facility and is now raising money to build a community activities building. Across Minnesota, approximately 1,750 4-H



clubs in the State sponsor community pride projects; the average club contributes 150 hours of service each year. Total contributed time is valued from \$525,000 to \$700,000 a year.

Extension applies the latest scientific and technical knowledge to specific community problems, emphasizing organizational and leadership development, often working with and through units of local government to achieve the desired results. Each year Extension, through its Community and Rural Development programs, helps people with more than 50,000 different community improvement projects. Several Gadsden County, Florida, communities didn't have adequate or sanitary home drinking water. The Extension staff and representatives of an electric cooperative and rural water system developed a project which resulted in helping the communities recognize the need for good water supplies. As a result a total of 231 homes in three communities got good, safe water.

#### SECTION 6--ASSURING ECONOMIC SECURITY AND STABILITY

##### Current Activities:

Continued inflation, rising energy costs, and unemployment have focused the Nation's attention on financial management and use of resources. In every State and County the Cooperative Extension Service has educational programs designed to assist people and their communities to improve abilities and adopt practices which promote economic stability in adverse conditions with some measure of security for the future. The programs encourage: economic, business, and industrial development; knowledge and use of financial planning and decisionmaking skills throughout the life cycle; and management and use of available resources (human, material, natural and environmental) by public and private sectors.

A variety of Extension educational programs have been directed to improving economic well-being by using available resources, acquiring greater self-sufficiency for individuals and, for some, acquiring job skills. Some programs dealt with concepts and principles of economics--spending, borrowing, saving, protecting (insurance, estate planning, etc.), investing and sharing (taxes, social security, etc.). Other programs focused on the efficiency, attractiveness, durability, comfort and safety of homes.

People and their governments in communities, large and small, across the Nation are struggling to provide necessary services for families and individuals. Extension programs utilizing volunteers play a vital role in many States in efforts to provide deregulated community services that fight inflation.

##### Selected Examples of Recent Progress:

The Extension Service-USDA in 1980 funded a special project with South Carolina Extension to provide farmers more information on farm credit sources. A publication on alternative sources of credit for South Carolina farmers is in preparation. The project is aimed at encouraging other States to prepare their own adaptation of the South Carolina publication. In addition, a financial management handbook is being prepared for use by Extension workers in conducting a complete financial management educational program for farmers.

In Missouri, 554 volunteers were involved in a program designed to establish early identification of handicapped children and locate services for them. Nearly 2,400 children were screened; conferences were held with 2,166 parents; and 82 children were referred for diagnostic work. In addition to the social impact to the community, families had less cost per child and both educational systems and taxpayers benefitted.



Maryland Extension has assisted Dorchester County residents to keep rail service on branch lines necessary to several industries providing approximately 2,000 jobs. Because Extension has helped leaders perform activities such as keeping use records, appearing at hearings, preparing subsidy requests and setting up a local rail users' association, the trains are still running. Community clubs in Lexington County have joined with South Carolina Extension to plan for rural fire protection. As a result 17 fire departments (15 volunteer) now protect about 95 percent of the county's 143,000 residents. Property owners save more in reduced fire insurance premiums than the system costs them. The community clubs provide ongoing manpower and financial support for the volunteer fire departments. Other community projects Extension has helped develop include: building a hospital, creating a countywide protection system, a solid-waste control system and fostering an atmosphere that helps attract industry.

In all States, a top priority is to help families cope with inflation and increasing energy costs. An estimated 31 million contacts are made in all areas of food, clothing, shelter, and human development. Reports from 4 States show 172,000 persons average \$32 of added value per garment for a total net gain of \$5.5 million. In Illinois, youth and adults were able to increase the value of their wardrobes \$467,235 by sewing rather than buying apparel. Nationally, over 400,000 youth participated in clothing and textile 4-H projects.

Kansas Extension reached 67,444 participants with information on selection, purchase, care, construction, and storage of clothing and other textile products. Estimating the value of improved buymanship and methods of care to be at least \$25 per person, this program was worth \$1.5 million in 1 year in expenditures saved or reallocated to more urgent family needs.

Through Extension programs in Kentucky, 8,227 people learned to "live on less". They reported an average \$20 monthly "savings" or increased discretionary income, for a total \$1.9 million annually available for reallocation. The Gulf Coast Money Management Counseling Center--one of two centers in Mississippi--reported that 4,430 people were reached in a special Extension campaign directed to families having overextended their use of credit. Eighty-two percent indicated they had reduced their debt load. The "Stretching Your Food Dollar" Extension program in Florida's Lee County, reached 2,242 elderly over the past 2 years. Of those elderly reached in 1980, 84 percent reported they had applied what they learned and 86 percent reported changing food preparation practices; participants also shared information with an additional 722 family members, friends, and neighbors.

Housing consumes a major part of any family's budget, especially today. Homeowners and some renters are seeking skills to upgrade and maintain their homes for comfort and economy. Louisiana Extension, working with the Forest Service and using research conducted by Wood Products Insect Laboratory and the Forest and Wood Products Disease Laboratory, cooperated in a Statewide public information and education mass media campaign (radio and television) to create awareness of wood decay and insect damage to homes. Forty-eight percent of the State's population recalled the radio message; 64 percent of respondents found the brochures helpful.

Seventy-six elderly volunteers in six Counties were taught do-it-yourself home weatherization by Arkansas Extension so that they could teach others. In one County alone, 12 families reported energy-efficient improvements of \$1,618 per family. An Extension letter series was offered to 587 West Virginia residents in 2 Counties on simple home repairs and maintenance. In follow-up evaluation, more than half had made electrical repairs, fixed toilet tanks, leaky faucets, etc. They reported saving approximately \$1,399 within 6 weeks

of course completion. Similar programs are now reaching 4,500 families in more than 25 Counties. Results include \$350,000 savings in service payments, and improved self-sufficiency of householders.

Sometimes improving an area's economic development means focusing on one particular group, such as Extension working with the only Indian Tribe in Mississippi, the Choctaws. A major manufacturer of greeting cards has begun construction of a 120,000-square foot building that will employ 300 Indians and non-Indians from the surrounding areas.

An estimated 3,000 elderly people were reached through meetings held by Wisconsin Extension to alert them to the possible need for health insurance to supplement Medicare. Information also was disseminated through electronic media, newsletters, exhibits, etc., to reach others at home or in the work force. The Office of the Insurance Commissioner reported large increases in requests for information as a result of this effort. Two hundred requests for information resulted from one Extension newspaper article. An evaluation of respondents who attended meetings revealed that 85 percent could better select policies and 79 percent planned to review current health insurance policies.

Approximately half of Georgia's feed producers are involved in an Extension program which saved about \$3 million. Since more than 80 percent of Georgia's poultry rations come from many other States their nutrients vary. Consequently, the rations are "overformulated" to counter this problem at a cost to poultry producers of more than \$6 million annually. Georgia Extension has been able to provide recommendations for more realistically priced, quality-controlled rations.

PART II

DESCRIPTION OF SPECIFICALLY FUNDED  
EXTENSION PROGRAMS CONDUCTED PRIMARILY  
THROUGH SMITH-LEVER 3(d) APPROPRIATIONS

SECTION A--INTEGRATED PEST MANAGEMENT

Current Activities:

Integrated pest management (IPM) uses suitable pest control techniques and methods to keep pest populations below economically injurious levels. It uses environmentally sound techniques that are compatible with the production of agricultural commodities and the users' objectives. IPM is more than chemical pesticide management. In many cases, it includes biological, cultural and sanitary controls for all pests. There are IPM projects in 50 States and 3 protectorates on more than 50 commodities. Some are entirely Cooperative Extension Service programs with advisory committees at the State and County levels. In others, Extension provides the leadership, the education for personnel, and assistance to private consultants.

Selected Examples of Recent Progress:

A 4-H corn insect field scouting project, conducted as a part of Nebraska's IPM program gives youth experience in integrated pest management. Following initial training at a University of Nebraska district station, apprentice field scouts conduct weekly field surveys and complete scouting reports for use by producers and County Extension agents in assessing the insect situation in their areas. One farmer reports the 4-H corn insect field scouting project saved him approximately \$14,000 in controlling corn rootworms on his 840-acre farm.

In Illinois, Cooperative Extension invested \$400,000 in a black cutworm pheromone trap project and realized a gross benefit of nearly \$2.9 million. From mid-March through May 1981, 211 cooperators monitored traps in 80 of the State's 99 Counties. Reports of black cutworms caught were sent weekly to the Extension entomologist. This information was fed into a computer that gave the target date in Illinois when cutworm activity would start. In preparation for the cutworm outbreak, the Extension agent prepared special information packets for growers and wrote several news releases.

In North Carolina, 17 farms with about 5,500 acres of corn, soybeans, and peanuts kept complete records for evaluation of IPM. Eleven of the farms received IPM services, while six others did not and served as a control group. Over 2 years, the per acre pesticide costs were about 25 percent less for the IPM farmers. In a cotton boll weevil eradication test, the costs for insect control prior to the test were \$52 per acre. With IPM, the control costs were sharply reduced to just \$13 per acre.

SECTION B--PESTICIDE IMPACT ASSESSMENT

Current Activities:

The Pesticide Impact Assessment program provides accurate and objective data for defining and evaluating the benefits and risks of selected pesticides having critical agricultural and forestry uses. The selected pesticides are reviewed for reregistration by the U.S. Environmental Protection Agency (EPA) to assess their value to agricultural productivity in comparison to possible hazards to human health or the environment.



Selected Example of Recent Progress:

The Extension Service, other USDA agencies, and the cooperating State Extension Services have established 29 assessment teams to address more than 50 pesticide active ingredients under review in EPA's rebuttable presumption against registration (RPAR) process. The potential adverse economic impact of the cancellation of the first 21 pesticides or groups of pesticides being considered is estimated at over \$6 billion annually.

SECTION C--FARM SAFETY

Current Activities:

In 1981, more than 6,000 people died in farm-related accidents, and several thousand more were injured or required medical attention. These farm-related accidents are costly to American agriculture. One State estimates an annual cost of more than \$12 million to its economy. The Cooperative Extension Services in many States have strong farm safety educational programs.

Selected Examples of Recent Progress:

Minnesota held farm accident rescue programs for some 550 emergency medical technicians (paramedics, rescue squads, etc.). Also held were safety workshops for 400 youth (4-H and FFA) with an increase over the past 4 years from 12 to 65 local FFA chapters participating. Disaster preparedness policies and procedures were updated in cooperation with the State's Department of Emergency Services. Extension is incorporated into the overall disaster communication system in the State. Training materials were developed in the safe use of farm machinery, safe storage and handling of grain, and in safe logging. Materials developed include a leader's guide, slide/tape sets, news releases, and an Extension bulletin.

Emphasis on farm safety with electricity continues in Louisiana. Special emphasis has been placed on "Look Up and Live," a program to caution farm families about the hazards of overhead electrical power lines. A new audience--fire protective agencies, underwriters, and warehouse management and employees--was contacted and a new program initiated on agricultural warehouse operations which covers storage safety, fork lift operations, pesticide and chemical safety, toxic and inflammable substance storage, and fire prevention.

Fires in rural areas of Missouri have always been a significant problem, both in terms of life loss and property damage. Extension held 15 half-day workshops across the State on home fire safety for homemakers, including information on extinguisher selection and use, detectors, and wood stoves. In addition, 12 1-hour fire safety programs were conducted for 600 youth in Perry County.

SECTION D--URBAN GARDEN PROGRAM

Current Activities:

The 16-city urban garden program continues to grow. The program, funded at \$3 million annually, is targeted at low-income residents, and generates an additional half a million dollars through cash and in-kind contributions from private and public organizations. The cities participating in the program are Atlanta, Baltimore, Boston, Chicago, Cleveland, Detroit, Houston, Jacksonville, Memphis, Milwaukee, Newark (NJ), New Orleans, New York, Los Angeles, Philadelphia, and St. Louis. Urban gardening in these cities teaches gardening skills as well as home use of produce and food preservation to more than 195,000 people, including some 45,000 youth. One of the keys to the success of this program is the recruitment

and use of nearly 3,000 volunteers selected from the local areas within the cities. It is estimated that in 1980 the gardeners produced food valued at \$5.8 million. Not only is the income of these people being augmented, but their diets and nutrition have improved. There is also improved communications between neighbors and they have a sense of participation. The gardeners tend to look after each other's gardens and consequently, vandalism in the gardening areas is very low and community pride has increased significantly.

#### Selected Examples of Recent Progress:

Since the inception of the urban gardening program in Houston in 1977, the amount of return, per dollar invested, has increased from 54 cents to \$1.84 in 1980. The number of gardens has increased from 746 in 1977, to more than 2,000 in 1980 with the average value of each gardener's produce going from \$107 to just over \$138 in 1980.

Using private money, the Philadelphia urban garden program set up a demonstration "fish farm" at one of their gardens. The success of this project has led to the development of three more fish farms for next year. Two 4-H clubs have combined energy and gardening projects. One club built a solar greenhouse atop a community center while the other club built cold frames. Both clubs will be growing vegetables through the winter months.

There are about 100 community gardens in the Boston program. The largest, a 7-acre garden involving some 400 families, last year grew (by conservative estimates) produce worth more than \$100,000. The total Boston program last year produced an estimated \$1 million worth of vegetables. They have also been active in working with Hispanic and Chinese gardeners. Two fact sheets, one on the use of fertilizers, the other on the problems of lead in vegetable gardens, were translated into Spanish and Chinese. Working cooperatively with the YMCA in the Dorchester section of Boston, the urban garden staff helped establish a 1½ acre community garden on a site where local gangs and vandals used to gather. The city helped by fencing the property and the growing vegetables converted the site from an eyesore to an attractive and productive garden.

### SECTION E--NON-POINT SOURCE POLLUTION

#### Current Activities:

Extension programs have created awareness of the impacts of management and development practices on the quality of the receiving waters--both surface waters and subsurface waters. Management of soils, pesticides, animal fertilizers, vegetation, onsite sewage disposal systems (especially septic tanks), and land development policies affect the quantity and quality of the runoff waters that recharge surface and ground water supplies. Extension helped landowners, decisionmakers, and interested community groups to appreciate and evaluate the trade-offs associated with the protection of their water resources. These programs have increased public awareness of the fragile nature of the water resource, its crucial role in the daily lives of the associated publics, and the importance of protecting the resource.

#### Selected Examples of Recent Progress:

In Wyoming, Extension programs on soil tillage have acquainted farmers with the use of chisels or sweeps for summer fallow tillage, to reduce soil disturbance, save fuel, and leave protective residues on the soil surface. Extension programs have helped to establish conservation tillage on nearly half the State's acreage of corn and soybeans. Extension programs in Illinois have resulted in substantial adoption of reduced tillage.

Cooperative Extension in New York has worked with several communities to help the public understand the potential impacts of residential and industrial development on the ground water resources.

Cooperative Extension in Michigan has developed educational materials on septic systems in cooperation with the State water quality agency and the State Department of Health. These materials present, in a positive manner, and in an identifiable way, actions that homeowners should take to manage their septic systems properly to preserve the system's useful life and to reduce the likelihood of water pollution from improperly treated household waters. Cooperative Extension in West Virginia has established, in cooperation with EPA, a clearing house for onsite waste disposal information.

#### SECTION F--ENERGY CENTERS

##### Current Activities:

Two regional energy centers were established in 1980 for research, development, and Extension programs on renewable energy. The goal of the two centers is to discover, develop, and demonstrate technology that will permit agriculture to be energy self-sufficient on a net basis by 1990, under conditions that sustain agricultural production of food, feed, and fiber. The center at Peoria, Illinois, is concentrating on the conversion of farm bio-mass renewable resources into fuel alcohol and petroleum replacements. The center at Tifton, Georgia, is concentrating on on-farm energy systems (solar, wind, biomass, etc.).

##### Selected Examples of Recent Progress:

Many seminars and workshops were held in the centers' first year. One such seminar involved a specialist from South Africa on the use of vegetable oils for diesel fuel. There were also three regional workshops on alcohol and vegetable oil as alternative fuels. These workshops were held in North Carolina, California, and at Peoria, Illinois. The workshops were attended by Extension specialists from 41 States. The workshops provided an exchange of technical information on the economical production of alcohol and vegetable oils for fuels, their use as alternative fuels, and the economics of using the byproducts. Out of the workshops came proceedings that have been sent to each State and County Extension office, to the USDA, and to members of the Senate and House Agriculture Committees as requested. The proceedings are one of the best references available on alcohol and vegetable oils as alternative fuels.

A special energy center computer package was developed at Peoria. One of the systems in this package is a computerized Energy Research Information System (ERIS) that stores and retrieves information about energy, thus providing inhouse management with quick access to and tracking of all literature maintained in the Peoria Energy Center's reference files.

Also out of the energy center funds a handbook on solar heating of livestock buildings was published. This handbook is for engineers, farmers, and others who want to use solar energy for heating livestock buildings. Slide sets are in production in North Dakota on vegetable oil production, extraction, and use as an alternative fuel on the farm. Another series of slide sets is being developed by the Wisconsin Cooperative Extension Service on the production of crops for conversion to alcohol and use on the farm. A seminar at Cornell University (New York) has led to the publication of proceedings on using spent grains and other alcohol production byproducts to improve the economics of alcohol production and use.



SECTION G--EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM (EFNEP)

Current Activities--Adult Program:

Since 1968 the Expanded Food and Nutrition Education Program (EFNEP), implemented by the USDA and the State Cooperative Extension Services, has provided nutrition education to a large number of low-income families. More than 1.9 million low-income families, representing 7.5 million family members, have been enrolled in this program since its start. The program emphasizes enrollment of homemakers who have young children. Currently 4,728 program aides, trained by Extension home economists, are employed to reach families in about 1,000 program locations. In FY 80 more than 270,000 low-income families were enrolled in in-depth nutrition education programs.

Families are taught to improve their diets through increased knowledge and improved practices of nutrition. Throughout its history, EFNEP has had a positive impact on the diets of its program families. For example, dietary recall data from 6,340 adults at program entry indicated that 35 percent did not use milk products. Data from the same population after one year in the program indicated there was a very positive change reported in participants' diets so that now only 1.5 percent reported using no milk. EFNEP also increases the homemakers' ability to select and buy food, prepare and serve balanced meals, and to manage food-related resources such as gardens and food stamps.

Sixteen EFNEP/Food Stamp pilot projects were funded in FY 80 by a \$2 million transfer from the Food and Nutrition Service of USDA. The projects were designed to explore the relationship of increasing the number of participants that can be reached (with a fixed level of resources) while still obtaining the favorable behavior change resulting from the one-to-one teaching method. These projects were experimental variations of the traditional EFNEP approach and tested ways to increase Food Stamp recipients' participation in EFNEP and increase the cost-effectiveness of educational interventions. An analysis of the EFNEP pilot projects revealed that the one-to-one teaching method was the most effective in bringing about behavior change and the projects were successful in increasing Food Stamp enrollment and participation in EFNEP.

As a result of the FY 80 projects, 10 additional States received funds for FY 81 EFNEP/Food Stamp Projects. These projects will test more specific educational methods on a systematic basis. The three educational methods that will be tested are: limited one-to-one contacts plus group lessons; limited one-to-one contacts plus group lessons supplemented by telephone contacts; and limited one-to-one contacts plus mailed lessons supplemented by telephone contacts.

Selected Examples of Recent Progress:

During FY 1980 the North Carolina EFNEP program reached nearly 15,000 low-income families representing about 75,000 individuals. In analyzing the program's overall impacts, the following results are noted:

- The paraprofessional program delivery method enabled more than 8,000 disadvantaged families to save an average of \$10-15 per month on their food expenditures.
- Fifty-three percent of all EFNEP families made more efficient use of their food stamps.
- Improved dietary changes occurred in more than 10,000 program families. After 2 years of participation, the percentage of homemakers consuming the recommended daily food allowances included these: 67 percent--milk; 89 percent--meat; 54 percent--fruits and vegetables; and 73 percent--breads and cereals.

- More than 7,000 program families produced and preserved foods at home.
- More than 5,000 program families, for the first time, made use of services and programs of local agencies, as a result of referrals made by program aides.
- More than 5,000 program families improved their food safety and sanitary practices.

Over 9,000 Missouri families participated in the EFNEP program last year. Of these families, the "average EFNEP family" contained 2.7 children; 37 percent received welfare assistance; 50 percent received food stamps; and 75 percent had an annual income of less than \$6,200. During FY 80, 1,712 Missouri families produced food valued at \$580,726. Food was preserved by 1,365 of these families. Seventeen percent of these families produced food and 22 percent of these preserved food for the first time. The value of food produced averaged \$339 per family. In many instances, this is the food that family members would have done without had they not produced and preserved it themselves.

"Working with Groups" was the special Nebraska emphasis this year to improve program effectiveness and efficiency by reaching more families in less time. The training of staff to work with groups has resulted in a 17 percent increase in adult group meetings compared with the previous year. The number of new program families also increased by 21 percent.

Michigan's EFNEP paraprofessional aides staff have also benefited due to their participation in EFNEP. For example, out of a total of 109 aides in Michigan, 26 no longer receive public assistance, 18 aides furthered their education by receiving additional formal schooling, and 10 aides left EFNEP to accept other employment to improve their financial status.

#### Current Activities--Youth Program:

In 1980, 671,048 youth participated in 4-H EFNEP at 937 sites. More than 44,211 volunteers also gained increased nutrition knowledge through training and assisting with the 4-H EFNEP program. The objectives for the youth audiences are to: educate youth on the principles of food and nutrition; and contribute to the personal development of low-income youth. The impact of inflation over the past years has resulted in fewer staff and fewer people being served. Trained volunteers and paraprofessionals organize and teach nutrition education to children 9-12 years in age, in 4-H clubs, nutrition camps, and in special interest groups. Youth enrolled in 4-H/EFNEP are from families enrolled in EFNEP and from nonenrolled families.

#### Selected Examples of Recent Progress:

Also in Oregon, in Lane County, the 4-H/EFNEP agent developed a relationship with the public schools to include 4-H/EFNEP materials as part of the science curriculum in the 1st through 6th grades. Teachers organized 4-H/EFNEP clubs involving 8,301 children from limited-income areas, a 233 percent increase over FY 1978-79. A teacher survey of all classrooms involved in 4-H/EFNEP provided the following results: 87 percent stated that the 4-H/EFNEP program is effective in creating an awareness of good eating habits; 90 percent believed the program is an effective way of teaching basic nutrition to children; 35 percent stated the program was effective in changing eating habits, and 26 percent noticed a change in students' eating habits.

In 16 Counties of Texas, high school and junior high school youth have been trained by paraprofessionals to be volunteers for EFNEP youth groups. Goals are to develop leadership involving increased understanding of self and others, learn nutrition education, and expand nutrition training to more poor youth. Staff resources include 33 paraprofessionals, 16 Extension EFNEP agents, and 3 specialists working with the youth phase. Federal funding of the program is enhanced by contributions from local businesses for food supplies and other materials for youth group activities.

In Kansas City, Missouri, 4-H Youth agents developed a central city urban 4-H gardening program to help youth and their families save money and learn about the nutritional value of vegetables. The program involved an inschool 4-H enrichment program, a followup 4-H special interest group, and EFNEP emphasis in cooperation with churches and other community organizations. City government and local churches donated in-kind resources of approximately \$4,000. Participants included 784 youth and many volunteer leaders. There was an increase in the amount of vegetables served in the homes of the youth and their gardens are estimated to have saved each family \$200 on food costs during the year. Surveys and food recalls indicate significant changes in family dietary habits as a result of the program.

#### SECTION H--RENEWABLE RESOURCES EXTENSION

##### Current Activities:

Extension conducts programs which enable individuals to recognize, analyze, and resolve problems dealing with privately owned or privately managed renewable forest and rangeland resources. These programs involve fish and wildlife management, range management, timber harvesting, wood processing, wood products marketing, watershed management, outdoor recreation, urban forestry, and management of shelterbelts. The programs teach owners and users how to benefit by applying knowledge to capitalize on resource opportunities and solve resource problems. Ongoing activities result in increased production of forest and range products, increased use of wood for fuel while improving forest growing conditions, protection of the long-term productivity of the land and of the environment, and more efficient use of private forest and rangeland.

##### Selected Examples of Recent Progress:

An impact assessment of a sample of small woodlot owners in 17 States, who were known participants in educational programs, found a 16 percent increase in personal income from their forestlands as a result of Extension's small woodlot education programs. There were additional benefits to owners who chose to manage for nonincome benefits.

North Carolina workshops reached those who log over half the timber in the area. Loggers learned how to analyze their logging operations through video tape and minicomputers. They estimated they were able to increase their productivity from 5 to 10 percent as a result.

More knowledgeable public policy decisions concerning rangeland are being made in Wyoming as a result of a workshop for environmental groups. Participants, who are active in public policy formulation, increased their technical knowledge of rangeland and improved their understanding of the factors which affect ranchers. All gained knowledge and some changed their attitudes.



## HIGHER EDUCATION

The Food and Agriculture Act of 1977 established the Department of Agriculture as the lead agency in the Federal Government for food and agricultural sciences and included teaching, i.e., higher education in the food and agricultural sciences, as an area of responsibility of the Department. The Act, P.L. 95-113, authorized transfer of the administration of Section 22 of the Bankhead-Jones Act to the Department of Agriculture. In addition, the Act authorized establishment of competitive grants and fellowships for all colleges and universities for the purpose of furthering education in the food and agricultural sciences.

In an effort to be responsive to this legislation, the Office of Higher Education provides direction and national leadership to the Science and Education mission of strengthening formal education and training programs in the food and agricultural sciences. Previous appropriations under the provisions of the Bankhead-Jones Act were administered by the Office. In addition, the Office of Higher Education is involved with joint planning and coordination of the broad programs of Science and Education, especially as these are of mutual concern to Extension, research, and teaching.

### Current Activities:

The Office of Higher Education strives to encourage and coordinate interface between the producers and the users of graduates of higher education in the food and agricultural sciences for the purpose of addressing issues of national significance and coordinating the development of mutually beneficial solutions. This entails extensive dialogue and policy/program development with representatives of colleges and universities, professional organizations, business and industry, government, the Congress, and the public.

Based on suggestions emanating from such dialogue and developmental activities, the Office is currently engaged in a variety of pursuits. These include: continuing assessment of the supply of and demand for graduates of higher education in the food and agricultural sciences; designing a comprehensive system for collecting/analyzing national statistics on higher education in the food and agricultural sciences; encouraging the exchange of scientists between industry, universities, and government; recruiting outstanding students, particularly females and minorities, into the food/agricultural disciplines; expanding opportunities for educational enrichment of college and university students; responding to requests from cooperators for information requisite to educational planning and resource allocation.

### Selected Examples of Recent Progress:

**Analysis of Supply/Demand for Food and Agricultural Expertise:** Ongoing manpower assessment studies have resulted in publications addressing the sex, race, and ethnicity of graduates of higher education and of professionals in the food and agricultural labor force. Additionally, a publication was released for national distribution summarizing supply/demand for graduates in the academic specializations comprising home economics.

**Food and Agricultural Education Information System (FAEIS):** An indepth review was conducted of the numerous national data bases maintained by public and private agencies (e.g., National Science Foundation, Bureau of Labor Statistics, National Center for Educational Statistics and the National Academy of Sciences) which contain information relevant to higher education in the food and agricultural sciences. An integral part of the review process was that of proposing recommendations for modifying sampling procedures and/or

types of data collected in order to better meet the information needs of the food and agricultural science and education community. The Office of Higher Education has subsequently contacted appropriate agency representatives to pursue implementation of these recommendations.

Because existing data bases fail to include many types of essential data (e.g., college and university faculty), a national panel was established and charged with responsibility for proposing and prioritizing overall content for a national data base to provide information essential for planning, administering, and evaluating higher education programs in the food and agricultural sciences. The panel included representatives of land-grant and nonland-grant programs in agriculture and home economics as well as representatives of schools of forestry and veterinary medicine.

Thus far, the content of FAEIS has been identified and prioritized. Procedures for sequential implementation have been established. Survey instruments for collecting data and sampling methodology are in the developmental stages.

Student Internships and Exchange of Scientists Between Industry, Government, and Education: In response to an expressed interest by representatives of industry in strengthening linkages between food and agricultural industries and the teaching and research community, the Office of Higher Education expanded its role in facilitating cooperative ventures between industry, the Federal Government, and colleges and universities. The Office established procedures for serving as a clearinghouse to encourage the exchange of scientists between industry, education, and Government. Additionally, the clearinghouse function is designed to strengthen opportunities for educational enrichment of university students via expansion of internships with industry.

Recruitment of Students into the Food and Agricultural Sciences: Currently under consideration is a memorandum of understanding between the U.S. Department of Labor and the U.S. Department of Agriculture to provide for the development, publication, and distribution of an "Agricultural Careers Guidebook." The guidebook will provide current information on the requirements and opportunities for occupations in food and agriculture. It will be distributed to Federal and State Employment Services, community groups, guidance counselors, students and others involved in career guidance and vocational decisions. The data developed for this guidebook will also be used to update and add food and agricultural occupations to the Dictionary of Occupational Titles, which is published by the U.S. Department of Labor.

The Office of Higher Education also coordinated the Department of Agriculture's participation in the Research Apprenticeship Program. In 1981, this program resulted in 305 youth (199 Blacks, 35 Asians, 27 Hispanics, 8 American Indians, 1 Hispanic and American Indian, and 35 Whites) participating in summer research internships under USDA's sponsorship in the Cooperative State Research Service, the Agricultural Research Service, the Forest Service, and the Economic Research Service.

PAYMENTS TO STATES

Federal funds are available for FY 1982 through the appropriation "Payments to States" for cooperative Extension work under the Smith-Lever Act, the D. C. Public Postsecondary Education Reorganization Act, and section 1444 of the National Agricultural Research, Extension, and teaching Policy Act of 1977 totaling \$315,702,000. Amounts appropriated are made available to States, Puerto Rico, Guam, the Virgin Islands, the District of Columbia, American Samoa, and Micronesia by letter of credit. Funds are disbursed in accordance with plans of work submitted by the States and approved by the Extension Service on behalf of the Secretary of Agriculture.

Use of these funds is indicated in the following tables:

Table I reflects estimated allotments to States, Puerto Rico, Guam, the Virgin Islands, the District of Columbia, American Samoa, and Micronesia under the formula provisions of Section 3(b) and 3(c) of the Smith-Lever Act.

Supplementary Tables 1A, 1B, 1C and 1D reflects the estimated allotments for pesticide impact assessment; food and human nutrition education (EFNEP); payments to the 1890 Land-Grant Colleges and Tuskegee Institute; and Non-point pollution.

Table II shows the basis on which the allotments will be made and the extent to which they must be matched by the State, County, and local sources.

Table III indicates the sources of funds allotted for cooperative Extension work in the States, Puerto Rico, Guam, the Virgin Islands, the District of Columbia, American Samoa, and Micronesia for FY 1982.

Table IV indicates the various classes of field agents employed with Extension funds.



Table 1

## APPROPRIATIONS FOR PAYMENTS TO STATES, STATE ALLOTMENTS, FY 1982 - 1983

Smith-Lever Act: Sec. 3(b) & 3(c)	FY 1982	Inc. or Dec. FY-1983	Total Proposed for FY-1983
Alabama	4,866,051	-0-	4,866,051
Alaska	673,592	-0-	673,592
American Samoa	478,848	-0-	478,848
Arizona	1,194,756	-0-	1,194,756
Arkansas	4,054,872	-0-	4,054,872
California	4,746,445	-0-	4,746,445
Colorado	1,874,923	-0-	1,874,923
Connecticut	1,418,138	-0-	1,418,138
Delaware	794,159	-0-	794,159
Florida	2,741,243	-0-	2,741,243
Georgia	5,348,765	-0-	5,348,765
Guam	607,082	-0-	607,082
Hawaii	872,538	-0-	872,538
Idaho	1,666,168	-0-	1,666,168
Illinois	6,248,826	-0-	6,248,826
Indiana	5,579,952	-0-	5,579,952
Iowa	5,901,343	-0-	5,901,343
Kansas	3,503,580	-0-	3,503,580
Kentucky	6,038,305	-0-	6,038,305
Louisiana	3,594,510	-0-	3,594,510
Maine	1,418,818	-0-	1,418,818
Maryland	2,163,064	-0-	2,163,064
Massachusetts	1,776,281	-0-	1,776,281
Michigan	5,712,587	-0-	5,712,587
Micronesia	519,113	-0-	519,113
Minnesota	5,575,194	-0-	5,575,194
Mississippi	5,113,863	-0-	5,113,863
Missouri	5,530,643	-0-	5,530,643
Montana	1,572,856	-0-	1,572,856
Nebraska	3,146,349	-0-	3,146,349
Nevada	677,602	-0-	677,602
New Hampshire	988,318	-0-	988,318
New Jersey	1,746,810	-0-	1,746,810
New Mexico	1,298,723	-0-	1,298,723
New York	5,427,598	-0-	5,427,598
North Carolina	8,110,220	-0-	8,110,220
North Dakota	2,200,300	-0-	2,200,300
Ohio	6,878,037	-0-	6,878,037
Oklahoma	3,587,205	-0-	3,587,205
Oregon	2,204,938	-0-	2,204,938
Pennsylvania	6,764,214	-0-	6,764,214
Puerto Rico	5,351,728	-0-	5,351,728
Rhode Island	678,698	-0-	678,698
South Carolina	3,986,052	-0-	3,986,052
South Dakota	2,263,305	-0-	2,263,305
Tennessee	5,890,457	-0-	5,890,457
Texas	8,102,351	-0-	8,102,351
Utah	1,052,068	-0-	1,052,068
Vermont	1,115,523	-0-	1,115,523
Virgin Islands	589,403	-0-	589,403
Virginia	4,879,170	-0-	4,879,170
Washington	2,626,948	-0-	2,626,948
West Virginia	2,842,387	-0-	2,842,387
Wisconsin	5,572,725	-0-	5,572,725
Wyoming	942,327	-0-	942,327
Subtotal	180,509,971	-0-	180,509,971
3(b) Special Need	1,544,909	-0-	1,544,909
TOTAL	182,054,880	-0-	182,054,880

Table 1A

APPROPRIATIONS FOR PAYMENTS TO STATES  
PESTICIDE IMPACT ASSESSMENT, FY 1982 - 1983

Smith-Lever Act: Section 3(d)	FY 1982	Inc. or Dec. FY 1983	Total Proposed for FY-1983
Alabama	27,692	-2,216	25,476
Alaska	8,594	-66	8,528
Arizona	20,068	-1,358	18,710
Arkansas	44,174	-4,070	40,104
California	98,520	-10,185	88,335
Colorado	21,271	-1,493	19,778
Connecticut	11,815	-428	11,387
Delaware	11,555	-400	11,155
Florida	39,534	-3,548	35,986
Georgia	62,648	-6,149	56,499
Guam	8,749	-84	8,665
Hawaii	11,841	-432	11,409
Idaho	21,022	-1,466	19,556
Illinois	89,070	-9,121	79,949
Indiana	45,483	-4,217	41,266
Iowa	85,458	-8,714	76,744
Kansas	37,666	-3,337	34,329
Kentucky	23,758	-1,773	21,985
Louisiana	26,290	-2,057	24,233
Maine	14,740	-759	13,981
Maryland	18,284	-1,157	17,127
Massachusetts	15,655	-862	14,793
Michigan	36,918	-3,253	33,665
Minnesota	57,159	-5,531	51,628
Mississippi	44,480	-4,104	40,376
Missouri	40,738	-3,683	37,055
Montana	18,179	-1,145	17,034
Nebraska	56,840	-5,495	51,345
Nevada	10,108	-236	9,872
New Hampshire	9,877	-212	9,665
New Jersey	16,218	-924	15,294
New Mexico	12,651	-523	12,128
New York	33,395	-2,857	30,538
North Carolina	50,806	-4,816	45,990
North Dakota	23,030	-1,692	21,338
Ohio	46,330	-4,313	42,017
Oklahoma	30,321	-2,511	27,810
Oregon	22,828	-1,669	21,159
Pennsylvania	27,670	-2,214	25,456
Puerto Rico	8,628	-71	8,557
Rhode Island	10,901	-326	10,575
South Carolina	29,039	-2,367	26,672
South Dakota	21,821	-1,555	20,266
Tennessee	25,890	-2,013	23,877
Texas	87,190	-8,910	78,280
Utah	12,255	-479	11,776
Vermont	10,651	-298	10,353
Virgin Islands	9,096	-71	9,025
Virginia	26,154	-2,096	24,058
Washington	29,904	-2,465	27,439
West Virginia	12,121	-463	11,658
Wisconsin	38,561	-3,439	35,122
Wyoming	11,354	-377	10,977
Subtotal	1,615,000	-134,000	1,481,000
Special Project	235,000	-0-	235,000
TOTAL	1,850,000	-134,000	1,716,000

TABLE 1B

APPROPRIATIONS FOR PAYMENTS TO STATES  
FOOD AND HUMAN NUTRITION EDUCATION, FY 1982 - 1983

SMITH-LEVER ACT: SEC. 3(D)	FY 1982	INC. OR DEC. FY-1983	TOTAL PROPOSED FOR FY-1983
ALABAMA	1,930,631	-0-	1,930,631
ALASKA	170,104	-0-	170,104
AMERICAN SAMOA	62,048	-0-	62,048
ARIZONA	550,975	-0-	550,975
ARKANSAS	1,230,693	-0-	1,230,693
CALIFORNIA	3,253,522	-0-	3,253,522
COLORADO	546,323	-0-	546,323
CONNECTICUT	446,033	-0-	446,033
DELAWARE	217,492	-0-	217,492
FLORIDA	1,997,263	-0-	1,997,263
GEORGIA	2,101,848	-0-	2,101,848
GUAM	62,253	-0-	62,253
HAWAII	253,063	-0-	253,063
IDAHO	286,884	-0-	286,884
ILLINOIS	2,088,948	-0-	2,088,948
INDIANA	1,176,353	-0-	1,176,353
IOWA	882,051	-0-	882,051
KANSAS	678,957	-0-	678,957
KENTUCKY	1,622,705	-0-	1,622,705
LOUISIANA	1,830,480	-0-	1,830,480
MAINE	412,377	-0-	412,377
MARYLAND	825,893	-0-	825,893
MASSACHUSETTS	952,395	-0-	952,395
MICHIGAN	1,743,072	-0-	1,743,072
MICRONESIA	68,403	-0-	68,403
MINNESOTA	971,370	-0-	971,370
MISSISSIPPI	1,669,638	-0-	1,669,638
MISSOURI	1,517,459	-0-	1,517,459
MONTANA	291,125	-0-	291,125
NEBRASKA	526,829	-0-	526,829
NEVADA	168,372	-0-	168,372
NEW HAMPSHIRE	233,803	-0-	233,803
NEW JERSEY	1,051,598	-0-	1,051,598
NEW MEXICO	498,513	-0-	498,513
NEW YORK	3,341,357	-0-	3,341,357
NORTH CAROLINA	2,459,639	-0-	2,459,639
NORTH DAKOTA	336,655	-0-	336,655
OHIO	2,145,890	-0-	2,145,890
OKLAHOMA	1,028,013	-0-	1,028,013
OREGON	484,154	-0-	484,154
PENNSYLVANIA	2,634,568	-0-	2,634,568
PUERTO RICO	1,409,271	-0-	1,409,271
RHODE ISLAND	296,990	-0-	296,990
SOUTH CAROLINA	1,486,566	-0-	1,486,566
SOUTH DAKOTA	380,162	-0-	380,162
TENNESSEE	1,929,426	-0-	1,929,426
TEXAS	4,105,005	-0-	4,105,005
UTAH	302,778	-0-	302,778
VERMONT	229,944	-0-	229,944
VIRGIN ISLANDS	61,110	-0-	61,110
VIRGINIA	1,648,300	-0-	1,648,300
WASHINGTON	666,445	-0-	666,445
WEST VIRGINIA	952,946	-0-	952,946
WISCONSIN	936,859	-0-	936,859
WYOMING	184,969	-0-	184,969
SPECIAL STUDIES	800,000	-800,000	-0-
UNDISTRIBUTED <sup>1/</sup>	-0-	+800,000	800,000
<hr/>			
SUBTOTAL	60,140,520	-0-	60,140,520
FEDERAL ADMINISTRATION	213,480	-0-	213,480
<hr/>			
TOTAL	60,354,000	-0-	60,354,000
<hr/>			

<sup>1/</sup> UNDISTRIBUTED AT THIS TIME FOR COMPARABILITY PURPOSES.



Table 1C

APPROPRIATIONS FOR PAYMENTS TO THE 1890 LAND-GRANT COLLEGES AND TUSKEGEE INSTITUTE  
FISCAL YEAR 1982 - 1983

Food and Agr'l Act: Section 1444	FY 1982	Inc. or Dec. FY 1983	Proposed for FY 1983
ALABAMA:			
Alabama A&M University	658,493	+275,692	934,185
Tuskegee Institute	658,493	+275,692	934,185
ARKANSAS:			
Univ. of Arkansas at Pine Bluff	572,011	+249,539	821,550
DELAWARE:			
Delaware State College	221,251	+80,742	301,993
FLORIDA:			
Florida A&M University	505,208	+221,362	726,570
GEORGIA:			
Fort Valley State College	741,653	+321,235	1,062,888
KENTUCKY:			
Kentucky State University	901,191	+427,615	1,328,806
LOUISIANA:			
Southern Univ. and A&M College	548,991	+229,864	778,855
MARYLAND:			
Univ. of Maryland Eastern Shore	420,285	+161,636	581,921
MISSISSIPPI:			
Alcorn State University	693,032	+288,492	981,524
MISSOURI:			
Lincoln University	854,450	+396,156	1,250,606
NORTH CAROLINA:			
North Carolina A&T State Univ.	1,174,164	+519,549	1,693,713
OKLAHOMA:			
Langston University	533,823	+241,633	775,456
SOUTH CAROLINA:			
South Carolina State College	592,219	+237,318	829,537
TENNESSEE:			
Tennessee State University	866,370	+389,958	1,256,328
TEXAS:			
Prairie View A&M University	1,072,800	+514,594	1,587,394
VIRGINIA:			
Virginia State College	736,926	+315,483	1,052,409
Subtotal	11,751,360	+5,146,560	16,897,920
Federal Administration	489,640	+214,440	704,080
TOTAL	12,241,000	+5,361,000	17,602,000

Table 1D

APPROPRIATIONS FOR PAYMENTS TO STATES  
NONPOINT SOURCE POLLUTION, FY 1982 - 1983

Smith-Lever Act: Section 3(d)	FY 1982	Inc. or Dec. FY 1983	Total Proposed FY 1983
Alabama	14,944	-14,944	-0-
Alaska	3,246	-3,246	-0-
American Samoa	2,690	-2,690	-0-
Arizona	5,341	-5,341	-0-
Arkansas	13,322	-13,322	-0-
California	18,076	-18,076	-0-
Colorado	7,941	-7,941	-0-
Connecticut	6,076	-6,076	-0-
Delaware	3,728	-3,728	-0-
Florida	11,979	-11,979	-0-
Georgia	17,644	-17,644	-0-
Guam	2,912	-2,912	-0-
Hawaii	3,347	-3,347	-0-
Idaho	7,612	-7,612	-0-
Illinois	25,501	-25,501	-0-
Indiana	23,838	-23,838	-0-
Iowa	24,822	-24,822	-0-
Kansas	13,944	-13,944	-0-
Kentucky	23,314	-23,314	-0-
Louisiana	12,346	-12,346	-0-
Maine	6,023	-6,023	-0-
Maryland	8,419	-8,419	-0-
Massachusetts	7,452	-7,452	-0-
Michigan	24,110	-24,110	-0-
Micronesia	2,958	-2,958	-0-
Minnesota	23,611	-23,611	-0-
Mississippi	15,538	-15,538	-0-
Missouri	21,499	-21,499	-0-
Montana	6,939	-6,939	-0-
Nebraska	13,018	-13,018	-0-
Nevada	3,347	-3,347	-0-
New Hampshire	4,880	-4,880	-0-
New Jersey	7,336	-7,336	-0-
New Mexico	5,440	-5,440	-0-
New York	21,230	-21,230	-0-
North Carolina	28,871	-28,871	-0-
North Dakota	9,061	-9,061	-0-
Ohio	27,944	-27,944	-0-
Oklahoma	12,840	-12,840	-0-
Oregon	9,783	-9,783	-0-
Pennsylvania	26,720	-26,720	-0-
Puerto Rico	17,727	-17,727	-0-
Rhode Island	3,198	-3,198	-0-
South Carolina	12,803	-12,803	-0-
South Dakota	9,566	-9,566	-0-
Tennessee	21,274	-21,274	-0-
Texas	28,533	-28,533	-0-
Utah	4,463	-4,463	-0-
Vermont	4,978	-4,978	-0-
Virgin Islands	2,938	-2,938	-0-
Virginia	17,224	-17,224	-0-
Washington	11,240	-11,240	-0-
West Virginia	10,168	-10,168	-0-
Wisconsin	23,867	-23,867	-0-
Wyoming	4,379	-4,379	-0-
TOTAL	702,000	-702,000	-0-

Table II

APPROPRIATION FOR PAYMENTS TO STATES

BASIS OF ALLOTMENT AND MATCHING REQUIRED, FISCAL YEAR 1983

Item	Total Estimate 1983	Allotment	Amount Paid Without Matching	Amount Required Matching
Smith-Lever Act:	288,798,000			
Section 3(b)		\$ 56,475,091 - Fixed by	\$ 14,513,808	\$ 41,961,283
		Section 3(b)		
		of PL 87-749		
		1,544,909 - Special need	--	1,544,909
Section 3(c)		129,078,000	5,043,120	124,034,880
		49,533,952 - by farm pop-		
		ulation		
		49,533,952 - by rural		
		population		
		24,966,976 - equally; and		
		5,043,120 - for federal		
		administra-		
		tion and co-		
		ordination		
		Sec. 3(c) 1		
Retirement &		16,033,000 - Federal con-	16,033,000	--
Employee Compen-		tribution to		
sation Cost		these funds		
Penalty Mail		16,245,000 - Reimbursement	16,245,000	--
		to the Post-		
		al Service		
Section 3(d)		69,422,000 - Allocated on	69,422,000	--
		basis of ap-		
		proved pro-		
		jects.		
Title XIV, Food &	17,602,000	17,602,000 - 4% Federal	17,602,000	--
Agr'l Act, 1977		Adm., balance:		
Section 1444, as		paid to 1890		
amended, 1890		Colleges and		
Land-Grant		Tuskegee		
Colleges				
D. C. Public	983,000	983,000		
Postsecondary		943,680 - to District	39,320	943,680
Education		of Columbia		
Reorganization		39,320 - for Federal		
Act.		administra-		
		tion & Coord.		
TOTAL	307,383,000	307,383,000	138,898,248	168,484,752



TABLE III

SOURCES OF FUNDS ALLOTTED FOR COOPERATIVE EXTENSION WORK  
FOR FISCAL YEAR ENDING SEPTEMBER 30, 1982

STATES	GRAND TOTAL	TOTAL FEDERAL FUNDS	TOTAL WITHIN STATES	FUNDS FROM FEDERAL SOURCES			PL 95-113 SECTION 1444	FUNDS FROM NON-FEDERAL SOURCES		
				PENALTY MAIL	SMITH-LEVER ACT RETIREMENT	ALL OTHER		STATE (EST.)	COUNTY (EST.)	NON-TAX (EST.)
ALABAMA	19,765,166	9,292,466	10,472,700	404,319	461,683	7,109,478	1,316,986	8,444,313	1,827,687	200,700
ALASKA	4,470,614	1,059,114	3,411,500	38,807	61,771	958,536	-	3,352,500	-	59,000
AMERICAN SAMOA	543,586	543,586	-	-	-	543,586	-	N/A	-	-
ARIZONA	6,669,388	2,256,365	4,413,023	122,740	144,785	1,988,840	-	4,090,565	203,880	118,578
ARKANSAS	16,420,666	6,872,504	9,548,162	313,167	360,875	5,626,451	572,011	8,418,551	1,017,795	111,816
CALIFORNIA	44,461,228	9,317,264	35,143,964	625,253	61,448	8,630,563	-	27,151,376	5,917,173	2,075,415
COLORADO	13,980,271	2,996,281	10,983,990	189,524	182,299	2,624,458	-	5,745,944	4,439,219	798,827
CONNECTICUT	4,021,308	2,094,564	1,926,744	120,214	19,288	1,955,062	-	1,791,240	-	135,504
DELAWARE	2,417,019	1,418,221	988,798	48,554	48,482	1,099,934	221,251	863,014	20,000	105,784
FLORIDA	25,899,083	6,426,422	19,472,661	379,951	432,244	5,109,019	505,208	10,706,422	8,516,239	250,000
GEORGIA	34,569,555	9,964,568	24,604,987	520,202	670,853	8,031,860	741,653	17,777,951	4,117,784	2,709,252
GUAM	1,112,042	718,167	393,875	26,171	-	691,996	-	393,875	-	-
HAWAII	3,968,495	1,329,645	2,638,850	67,867	47,989	1,213,789	-	2,638,850	-	-
IDAHO	7,007,129	2,457,731	4,549,398	136,277	159,488	2,161,966	-	3,035,500	1,325,520	188,378
ILLINOIS	25,507,174	10,141,858	15,365,316	593,845	531,668	9,016,345	-	11,965,715	1,525,201	1,874,400
INDIANA	23,971,787	7,916,526	16,055,261	479,590	409,310	7,027,626	-	6,182,771	8,753,480	1,119,010
IOWA	22,651,648	8,052,518	14,599,130	462,262	432,582	7,157,674	-	8,895,537	5,513,770	189,530
KANSAS	22,486,324	5,295,522	17,190,802	355,584	497,291	4,442,647	-	6,649,571	8,205,616	2,335,615
KENTUCKY	23,343,371	9,711,014	13,632,357	497,097	500,644	7,812,082	901,191	9,501,102	4,131,255	-
LOUISIANA	23,319,056	7,331,387	15,987,669	373,816	498,614	5,909,966	548,991	15,385,279	586,235	16,155
MAINE	4,284,687	2,145,687	2,139,000	102,886	86,843	1,955,958	-	1,800,000	309,000	30,000
MARYLAND	10,887,830	4,168,516	6,719,314	218,766	259,805	3,269,660	420,285	5,244,686	1,449,628	25,000
MASSACHUSETTS	7,348,439	3,224,039	4,124,400	196,384	21,872	3,005,783	-	1,289,400	2,835,000	-
MICHIGAN	25,069,195	8,795,551	16,273,644	497,458	462,406	7,835,687	-	10,762,167	5,511,477	-
MICRONESIA	718,474	590,474	128,000	-	-	590,474	-	128,000	-	-
MINNESOTA	23,009,096	7,793,475	15,215,621	454,138	479,003	6,860,334	-	9,847,636	5,249,175	118,810
MISSISSIPPI	22,302,425	8,713,357	13,589,068	397,462	429,614	7,193,249	693,032	11,133,988	1,533,694	921,386
MISSOURI	22,663,473	9,300,516	13,362,957	466,954	475,388	7,503,724	854,450	9,367,088	2,356,957	1,638,912
MONTANA	6,569,217	2,333,070	4,236,147	122,559	123,112	2,087,399	-	1,893,163	2,064,924	278,060
NEBRASKA	15,452,899	4,594,070	10,858,829	265,878	307,856	4,020,336	-	6,394,551	3,761,327	702,951
NEVADA	3,062,625	1,133,113	1,929,512	54,692	71,892	1,006,529	-	1,810,594	118,918	-
NEW HAMPSHIRE	2,817,959	1,473,780	1,344,179	76,352	87,550	1,309,878	-	919,032	425,147	-
NEW JERSEY	10,004,620	3,476,059	6,528,561	203,602	196,495	3,075,962	-	3,751,390	2,777,171	-
NEW MEXICO	6,585,205	2,255,123	4,330,082	114,438	154,858	1,985,827	-	3,309,549	933,623	86,910
NEW YORK	34,905,127	10,392,256	24,512,871	668,211	263,465	9,460,580	-	6,271,500	15,548,704	2,692,667
NORTH CAROLINA	36,453,384	13,614,160	22,839,224	751,061	787,489	10,901,446	1,174,164	16,047,461	6,500,000	291,763
NORTH DAKOTA	8,648,292	3,089,059	5,559,233	159,022	182,991	2,747,046	-	3,203,629	1,825,434	530,170
OHIO	25,496,068	10,380,154	15,115,914	584,099	314,854	9,481,201	-	7,127,684	7,279,630	708,600
OKLAHOMA	18,492,751	6,091,172	12,401,579	301,795	343,925	4,911,629	533,823	8,526,579	2,950,000	925,000
OREGON	12,594,767	3,407,632	9,187,135	210,825	300,104	2,896,703	-	6,081,460	2,303,154	802,521
PENNSYLVANIA	19,241,156	10,541,156	8,700,000	599,982	201,002	9,740,172	-	5,500,000	3,200,000	-
PUERTO RICO	11,448,557	7,425,872	4,022,685	384,285	199,233	6,842,354	-	3,481,574	-	541,111
RHODE ISLAND	1,811,026	1,121,026	690,000	47,290	22,949	1,050,787	-	620,000	70,000	-
SOUTH CAROLINA	18,224,062	7,070,706	11,153,356	342,950	389,992	5,745,545	592,219	11,091,356	52,000	10,000
SOUTH DAKOTA	7,048,979	3,153,626	3,895,353	175,085	163,687	2,814,854	-	2,622,121	1,227,412	45,820
TENNESSEE	20,910,263	10,061,371	10,848,892	487,892	478,972	8,228,137	866,370	8,249,700	2,339,992	259,200
TEXAS	50,753,330	16,339,348	34,413,982	905,387	1,123,277	13,237,884	1,072,800	25,508,794	8,703,388	201,800
UTAH	6,183,615	1,747,012	4,436,603	98,733	108,715	1,539,564	-	3,492,000	899,603	45,000
VERMONT	3,686,859	1,585,498	2,101,361	75,449	75,953	1,434,096	-	1,818,020	239,000	44,341
VIRGIN ISLANDS	1,100,598	700,598	400,000	23,283	3,768	673,547	-	400,000	-	-
VIRGINIA	29,407,131	8,588,931	20,818,200	484,102	660,055	6,707,848	736,926	15,825,100	4,993,100	-
WASHINGTON	14,561,905	3,985,305	10,576,600	241,689	272,079	3,471,537	-	6,336,000	3,219,000	1,021,600
WEST VIRGINIA	8,689,187	4,284,490	4,404,697	214,433	191,435	3,878,622	-	2,142,539	2,250,528	11,630
WISCONSIN	26,611,715	7,889,994	18,721,721	486,448	512,534	6,891,012	-	10,885,907	7,586,126	249,688
WYOMING	4,610,872	1,443,960	3,166,912	76,170	106,761	1,261,029	-	2,110,137	1,056,775	-
UNALLOTTED 1/	3,870,129	3,870,129	-	-	-	3,870,129	-	-	-	-
GRAND TOTAL 2/	852,100,827	301,976,008	550,124,819	16,245,000	15,381,248	258,598,400	11,751,360	367,983,174	157,670,741	24,470,904
DISTRICT OF COLUMBIA 3/	1,807,180	943,680	863,500	-	-	943,680	-	863,500	-	-

1/ INCLUDES \$2.0 MIL. FOR THE RENEWABLE RESOURCES EXTENSION ACT AND \$300,000 FOR ENERGY DEMONSTRATION PROGRAM.

2/ RETIREMENT AND PENALTY MAIL INCLUDED IN TABLE III FOR THE FIRST TIME.

3/ D.C. PUBLIC POSTSECONDARY EDUCATION REORGANIZATION ACT.

Table IV

COOPERATIVE EXTENSION AGENTS, BY ORGANIZATION CLASSES  
(Staff-Year Equivalents)

Extension Workers by Organization Classes	Fiscal Year 1980	Fiscal Year 1981	Fiscal Year 1982
<u>State Workers:</u>			
Directors and Administrative personnel.....	493	508	507
Specialists.....	3714	3714	3706
Total, State Staff.....	4207	4222	4213
<u>County Workers:</u>			
Leaders and Supervisors.....	694	675	651
Area Agents.....	664	671	629
County Extension Agents.....	11,450	11,441	11,240
Total, County Staff.....	12,808	12,787	12,520
GRAND TOTAL.....	17,015	17,009	16,733 <sup>a/</sup>

<sup>a/</sup> Estimate based on preliminary data available at the beginning of the fiscal year.





NATIONAL AGRICULTURAL LIBRARY

Purpose Statement

The National Agricultural Library (NAL) had its mission outlined by the Organic Act of 1862, establishing the Department of Agriculture. The act sets forth a mission, "to acquire and to diffuse among the people of the United States useful information on subjects connected with agriculture in the most comprehensive and general sense of the word," and placed upon the Secretary the responsibility to "procure and preserve all information concerning agriculture which he can obtain by means of books..."

NAL has as its ultimate purpose the dissemination of useful information about agricultural and other related sciences to scientists and researchers, administrators and managers, farmers, and to the general public. In addition to providing traditional library services such as bibliographies, reference services and document delivery to agricultural scientists and researchers, NAL is expanding its role and serving a wider audience by using modern information dissemination technology to its fullest. Traditionally, the library has concentrated its thrust towards the agricultural scientist and researchers. The wider audience includes Federal, State and local administrators, as well as the farmer, the small businessman, public groups at all levels, and the general public.

With approximately 1.6 million volumes of printed material on agriculture and supporting scientific disciplines, NAL has one of the largest collections of its kind in the world. Both current and historical information is collected and organized for effective utilization by a wide range of users. NAL also provides input of U.S. publications to AGRIS, the International Information System for the Agricultural Sciences and Technology.

NAL operations are carried out at the National Agricultural Library Building at Beltsville, Maryland. Specialized services are provided from a branch library in Washington D. C., which includes the law collection and social sciences materials. Service is provided from these locations as well as 18 officially designated field libraries in the States and 30 "information" centers containing a total of approximately a quarter of a million volumes.

As of September 30, 1981 the employment was 166 full-time permanent And 32 other then permanent, all located in Beltsville and Washington.

NATIONAL AGRICULTURAL LIBRARY

Available Funds and Staff-Years

1981 and Estimated, 1982 and 1983

Item	Actual		Estimated		Budget Estimate	
	1981	Staff:	Available, 1982	Staff:	1983	Staff
	Amount	Years	Amount	Years	Amount	Years
National Agricultural Library.....	\$8,347,000	185	\$8,279,000	191	\$9,016,000	186
Obligations under other USDA						
appropriations:						
Forest Service: Current Research						
Information System.....	79,570	2	- -	- -	- -	- -
State Agricultural Experiment						
Stations: Current Research						
Information System.....	79,982	6	- -	- -	- -	- -
Economic Research Service: Current						
Research Information System.....	21,170	1	- -	- -	- -	- -
Forest Service: Regional Document						
Delivery.....	5,000	- -	- -	- -	- -	- -
1890 Institutions: Current Research						
Information System	27,375	- -	- -	- -	- -	- -
Office of International Cooperation						
and Development: Bibliography of						
Soils of the Tropics (SCS portion)..	21,739	- -	- -	- -	- -	- -
Office of International Cooperation						
and Development: CALS and						
conversion of bibliographic files...	14,590	- -	34,000	- -	34,000	- -
Agricultural Cooperative Service:						
Current Research Information						
System.....	2,190	- -	- -	- -	- -	- -
Office of Internatinal Cooperation						
and Development: AID update.....	69,425	- -	121,000	- -	121,000	- -
Food and Nutrition Service: Identifying:						
acquiring and developing automation						
materials.....	23,933	- -	- -	- -	- -	- -
Forest Service: Document Delivery						
Service to North Carolina Forest						
Experiment Station.....	4,000	- -	- -	- -	- -	- -
Office of Governmental and Public						
Affairs: On line search.....	1,000	- -	- -	- -	- -	- -
Food and Nutrition Service: Lending						
devices for print and audio visual						
materials.....	44,410	- -	- -	- -	- -	- -
Agricultural Marketing Service:						
Library Space.....	- -	- -	26,000	- -	26,000	- -
Total, Other USDA Appropriations...	394,384	9	181,000	- -	181,000	- -
Total, Agricultural Appropriation..	8,741,384	194	8,460,000	191	9,197,000	186
Other Federal Funds:						
Department of Energy: Ethanol						
Production.....	264,000	- -	16,000	- -	16,000	- -
Non-Federal Funds						
Sale of photocopies.....	60,121	- -	60,000	- -	60,000	- -
Total, National Agricultural						
Library.....	9,065,505	194	8,536,000	191	9,273,000	186

	1981 Actual	1982 Estimates	1983 Estimates
Full-Time Equivalent Staff-year:			
Ceiling.....	183	180	175
Non-Ceiling.....	11	11	11
Total.....	194	191	186

UNITED STATES DEPARTMENT OF AGRICULTURE

NATIONAL AGRICULTURAL LIBRARY

PERMANENT POSITIONS BY GRADE AND STAFF-YEAR SUMMARY

1981 and estimated 1982 and 1983

GRADE	1981 HEADQUARTERS	1982 HEADQUARTERS	1983 HEADQUARTERS
ES - 5	1	1	1
GS/GM-15	6	5	5
GS/GM-14	11	10	10
GS/GM-13	17	17	17
GS-12	16	16	16
GS-11	39	38	38
GS-9	8	7	7
GS-8	6	6	6
GS-7	20	18	18
GS-6	33	27	27
GS-5	42	31	31
GS-4	16	10	10
GS-3	5	5	5
GS-2	2	2	2
Total, Permanent Positions:	222	193	193
Staff-Years:			
Ceiling	183	180	175
Non-ceiling	11	11	11
Total, Staff Years.....	194	191	186



NATIONAL AGRICULTURAL LIBRARY

CLASSIFICATION BY OBJECTS

1981 and Estimated 1982 and 1983

	<u>1981</u>	<u>1982</u>	<u>1983</u>
Personnel Compensation:			
Headquarters.....	<u>\$4,126,972</u>	<u>\$4,065,000</u>	<u>\$4,065,000</u>
11 Total personnel Compensation.....	4,126,972	4,065,000	4,065,000
12 Personnel Benefits	<u>378,998</u>	<u>423,000</u>	<u>423,000</u>
Total Pers. Comp. & Benefits.....	4,505,970	4,488,000	4,488,000
Other Objects:			
21 Travel.....	51,000	48,000	50,000
22 Transportation of things.....	16,987	18,000	18,000
23.1 Standard Level User Charges.....	306,000	366,000	365,000
23.2 Communications, utilities and other rent.....	237,989	240,000	250,000
24 Printing and reproduction.....	156,986	160,000	170,000
25 Other services.....	1,495,948	1,659,000	2,153,000
26 Supplies and materials.....	1,213,980	1,100,000	1,322,000
31 Equipment.....	<u>214,982</u>	<u>200,000</u>	<u>200,000</u>
Total Other Objects...	<u>3,693,872</u>	<u>3,791,000</u>	<u>4,528,000</u>
Total direct obligations	<u>8,199,842</u>	<u>8,279,000</u>	<u>9,016,000</u>
Position Data:			
Average Salary, ES Positions.....	\$50,112	\$58,500	\$58,500
Average Salary, GS positions.....	22,826	23,652	23,652
Average Grade GS positions.....	8.56	8.56	8.56

NATIONAL AGRICULTURAL LIBRARY

The estimates include proposed changes in the Language of this item as follows (new lanuage underscored; deleted matter enclosed in brackets).

National Agricultural Library

For necessary expenses of the National Agricultural Library, [\$8,750,000] \$9,016,000 Provided, That this appropriation shall be available for employment pursuant to the second sentence of section 706 (a) of the Organic Act of 1944 (7 U.S.C. 2225), and not to exceed \$35,000 shall be available for employment under 5 U.S.C. 3109; Provided further, That not to excced \$375,000 shall be available pursuant to 7 U.S.C. 2250 for the alteration and repair of buildings and improvements.





NATIONAL AGRICULTURAL LIBRARY

Appropriation Act, 1982.....	\$8,750,000
Budget Estimate, 1983.....	9,016,000
Increase in Appropriation.....	<u>+266,000</u>

Adjustments in 1982

Appropriation Act, 1982.....	\$8,750,000
Activities transferred to Human Nutrition Information Service a/.....	-471,000
Adjusted base for 1983.....	8,279,000
Budget Estimate, 1983.....	9,016,000
Increase over adjusted, 1983.....	<u>+737,000</u>

a/ Pursuant to Secretary's Memorandum No. 1000-1 on June 17, 1981 the Food and Nutrition Information Center functions were transferred from this account to the Human Nutrition Information Service. Actual transfer of funds of \$471,000 were made in 1982.

SUMMARY OF INCREASES AND DECREASES  
(On basis of appropriation)

<u>Item of Change</u>	<u>1982 Estimated</u>	<u>Program Changes</u>	<u>1983 Estimated</u>
National Cost Sharing to regionalize indexing, document delivery, information creation, and dissemination.....	- -	+\$100,000	\$100,000
Integrated Reproduction Management System.....	- -	+50,000	50,000
All Other.....	\$8,279,000	+587,000 a/	8,866,000
TOTAL AVAILABLE.....	<u>8,279,000</u>	<u>+737,000</u>	<u>9,016,000</u>

a/ Includes a total increase of \$245,000 for the portion of pay increases effective in FY 1982 which were absorbed in FY 1982 but which are needed to carry out the programs proposed in FY 1983, and \$342,000 for increased cost of operations.

PROJECT STATEMENT  
(On basis of appropriation)

Project	1981		1982 (estimated)		1983 (estimated)	
	Amount	Staff: Years	Amount	Staff: Years	Increase	Amount Staff: Years
1. Agricultural Library Services for research and Education:	\$8,199,842	185	\$8,279,000	191	+\$737,000(1)	\$9,016,000: 186
Unobligated Balance	147,158	--	- -	--	- -	- -
Total available or estimate:	8,347,000	185	8,279,000	191	+737,000(1)	9,016,000: 186
Transfer to Human Nutrition Information Service.....	+475,000	--	+471,000	--		
Total, Appropriation.....	<u>8,822,000</u>	<u>185</u>	<u>8,750,000</u>	<u>191</u>		

# EXPLANATION OF PROGRAM

The basic function of the National Agricultural Library (NAL) is to identify, acquire, disseminate, and deliver pertinent food and agriculture information to all scientists, researchers, administrators, and others working in agricultural fields in both the government and private sectors. To meet user needs, NAL provides current awareness and retrospective searches on worldwide agricultural literature. These computer-based systems provide many different bibliographic data bases of interest to agricultural scientists and educators.

A national education and training program designed to inform actual and potential users of NAL about its operation, resources, and services has been accelerated. The emphasis in this program is on the use of online bibliographic files and other computer services. NAL also is working closely to aid the 1890 college libraries in updating and improving their information services and products.

Acquisitions of agricultural materials continues to be a major activity in carrying out the mission of the library component of NAL. Other primary activities for fiscal years 1982 and 1983 are as follows:

<u>Types of Activities</u>	<u>Estimated Productivity</u>	
	<u>FY 1982</u>	<u>FY 1983</u>
Serial Issues Added	180,000	180,000
Number of Titles Cataloged	16,000	16,000
Articles Indexed	120,000	120,000
Volumes Bound	18,000	18,000
Document Requests Filled	340,000	340,000
Reference Inquiries Answered	50,000	50,000
Automated Searches Conducted	10,000	10,000
Current Awareness (CALS) Searches	295,500	285,000 a/
Current Awareness (CALS) Profiles by all data bases	16,000	15,500 a/

a/ The number of profiles and searches will actually increase, however, due to a change in the reporting system a lower total is shown.

A major function of the bibliographic program is organization of materials for use of researchers and announcement of newly published research to the agricultural community. This includes cataloging books and journals acquired for the collection, and indexing journal articles, conference proceedings, and reports selected for their importance to agricultural research and education.

Resources of the collection are made available through direct loan, interlibrary loan of books, and photocopy of journal articles. Requests for documents from USDA field employees are handled locally in 27 States in cooperation with land-grant university libraries whenever possible, with NAL serving as a backup for document delivery.

NAL has expanded its services to major components of the agricultural community and the general public, through augmentation of its library and information network, and an intensified Current Awareness Literature Service (CALS). Specific efforts are aimed at accommodating special research classifications; expanding data bases on acid rain and aquaculture; and increased cooperation with AGRIS (International Information System for the Agricultural Sciences and Technology).

NAL is opening additional channels of information dissemination through the Congressional Research Service and the Visitor's Information Center of the Office of Governmental and Public Affairs, USDA. A national electronic mail network has been established cooperatively by NAL, Federal Extension Service (FES), Cooperative State Research Service (CSRS), and the Office of Governmental and Public Affairs (OGPA). The network is accessible to the entire state research and education community.

In addition, NAL must also provide for collection preservation. This involves the microfilming and restoring of important documents, unbound serial issues, newspapers, and historical materials. A nationwide project to film the documents of all land-grant institutions--bulletins, circulars, reports and other land-grant publications--before documents themselves deteriorate, is currently underway. The project is being conducted by NAL in conjunction with a private microfilming firm and land-grant institutions. The result is a collection which covers a period from the late 1890's into the 1970's. The collection is both a valuable research tool for a wide variety of subjects and a practical reference resource for the farmer and the lay public.



### Justification of Increases

(1) A net increase of \$737,000 for services consisting of:

- (a) An increase of \$245,000 to restore pay increases absorbed in FY 1982.
- (b) An increase of \$342,000 for National Agricultural Library for increased operating costs.

Need for Change. The increased funds are needed in order to maintain a current level of program effort. The costs of providing services has risen substantially over the last few years, especially for the purchase of books and journals, and for application of advanced technology. In fact, the cost of new publications is rising faster than the overall rate of inflation. During the past 12 months the cost of scientific journals has risen 26%. Increased usage of online data bases coupled with an increase in demand for other services, such as the current awareness literature service, have also contributed greatly to the problem. The lease charge for CALS has risen 25% and the royalty charge has increased by 50%.

Nature of Change. This increase would lessen the impact of inflation on non-salary operating costs enabling NAL to maintain the services it is currently providing.

- (c) \$100,000 for national cost sharing to regionalize indexing document delivery, and information creation and dissemination. (No funds in FY 1982).

Need for Change. The funding of this program is essential for achieving the effective decentralization of library systems in order to improve the timeliness and usefulness of such systems for Federal and State research organizations. NAL must have the ability in resources, equipment, and technologies to interact with the States in the development of a Federal/State system which will be compatible nationally.

Nature of Change. The increase will be used for NAL participation in planning and development of a Federal/State technical information network. It will also be used to purchase equipment to provide for decentralized input and use of regionalized systems.

- (d) \$50,000 for Integrated Reproduction Management (IRM) System. (No funds in FY 1982).

Need for Change. These funds are necessary if the National Agricultural Library is to provide a tracking procedure that will identify IRM programs and projects on a fiscal and program context basis. The tracking mechanism is essential to the accomplishment of IRM objectives since a coordinated effort involving participation of the Federal, State, and private sector levels is required. NAL will provide rapid access to program plans and accomplishments on a nationwide basis.

Nature of change. The funding increase will enable USDA to effectively coordinate IRM projects and avoid duplication and waste through use of the NAL tracking procedure and the Library's ability to store and retrieve all prior IRM plans, project designations, progress reports, and related information.

## National Agricultural Library

### Status of Program

The National Agricultural Library (NAL) reemerged as an independent agency of the U.S. Department of Agriculture in June 1981 as a result of departmental reorganization. The subsequent realignment within the NAL emphasizes the growing importance of three areas: (1) automated data processing, (2) service to and cooperation with State land-grant and similar institutions, and (3) broadened access by scientists, researchers, and technical information specialists across the nation to the library's 1.7 million item collection on agriculture and related subjects such as energy and aquaculture. Greater efficiency and reduction in the cost of providing basic services is being stressed in all NAL operations.

In these and other areas requiring special attention, NAL is strengthening cooperation and contacts with other USDA agencies responsible for research and education activities such as agricultural research, Extension, forestry, and technical information. The use of modern communications technology to transmit technical data from the library's large collection to farmers and other agricultural audiences continues to be explored in conjunction with both public and private groups.

#### Current Activities:

The National Agricultural Library is continuing its efforts to provide better, more efficient services to its users everywhere while holding down the cost of such services. To achieve these twin objectives, the latest advances in technology are being adapted to appropriate library operations, expansion of user fees are being considered, and cooperating State institutions are working with the NAL to hold down or reduce operating costs. Adoption of new technology and more efficient marketing procedures by NAL are illustrated in two areas. New micro computers will soon be introduced at the library for online data base searching and for interactive storage and retrieval of budgetary and personnel data for management purposes. NAL is now marketing its Agriculture On-Line Access (AGRICOLA) data base through the National Technical Information Service (NTIS). NTIS sells the AGRICOLA computer tapes to commercial vendors and institutions both in the United States and in foreign countries.

The Regional Document Delivery System offers a positive indication of how the State and Federal units can work together and achieve low costs. In fiscal year 1981 the system, jointly supported by NAL and 28 participating land-grant university libraries, filled 59,900 requests for documents, an increase of 9,000 over 1980. However, the cost per transaction stayed about the same in 1981 as it was the previous year.

NAL has also investigated the use of new and innovative techniques for information transfer such as the linking of word processors and micro computers with larger systems. With reference to word processors, NAL has successfully demonstrated their cost savings potential by eliminating the need for certain computer processing. NAL has also explored the use of innovative technology through cooperative funding of professional association activities. For example, NAL was chosen as a satellite receiving station for an American Libraries Association program, but without cost to the Government. This kind of coordinated and cooperative activity will be continued in the future.

Another project designed to eliminate costly duplication by both Federal and State Governments involves the inclusion in AGRICOLA, the NAL bibliographic data base of 60-75,000 4-H and other State Extension popular publications used by the nation's extension services in their educational programs. The States, Federal Extension, and the NAL are working together on this massive undertaking which will ensure mutual accessibility to State publications among all States and the Federal Government.

Selected Examples of Recent Progress:

Aquaculture. An aquaculture research project subfile is established in Current Research Information System (CRIS). All ongoing and recently completed projects directly or indirectly related to aquaculture have been classified in subject categories. Eighty-four translations of important scientific and technical publications in foreign languages were completed by NAL for the Interagency Committee on Marine Sciences and Fisheries and lists of the translations were distributed to key USDA, Commerce, Interior, and land-grant program officers in aquaculture, as well as information officers, libraries, and State experiment station directors. NAL is working with the interagency group to greatly expand national and international technical information resources.

Electronic Mail. A national electronic mail network to meet the needs of the Extension Service was implemented in March 1981 after a 1-year test. It is accessible to the Cooperative State Research Service (CSRS) and the entire State research and education community. The network serves a wide variety of devices, including programmable terminals, word processing equipment, telefacsimile machines, and optical character readers providing not only communication services, but electronic filing and retrieval, data transmission, hard copy production, and transmission services. There are now 44 State Extension Directors and 22 State Experiment Station Directors on the electronic mail system. The network is presently being used in a joint arrangement with USDA's Office of Governmental and Public Affairs to transmit daily news summaries and reports from the Foreign Agriculture Service and Agricultural Marketing Service agencies.

Visitors. An estimated 1,200 visitors, exclusive of USDA employees, visited the National Agricultural Library in fiscal year 1981. Visitors represented approximately 35 countries including Peoples Republic of China, Czechoslovakia, Union of Soviet Socialist Republic (USSR), Great Britain, The Netherlands, Belgium, Denmark, Tunisia, and Brazil. The majority of these visitors were scientists and technical information specialists, who were briefed on NAL resources and services, given tours of the facility, or met with subject specialists on NAL staff.

Education and Training. As a major producer of a large, commercially available data base, NAL has a responsibility to train its users in the efficient retrieval of information from AGRICOLA. To accomplish this goal, NAL offered training workshops at land-grant universities throughout the continental United States in fiscal year 1981. Since the program's inception, approximately 500 people have been reached by the workshops. To reduce the costs of this service, NAL has recently instituted a series of advanced classes, each one designed to train instructors who could in turn train people in their own universities. NAL also reduced its contracts for instruction and assumed the teaching activity directly, thereby gaining further budgetary efficiency. In fiscal year 1983, NAL will offer over 15 workshops, training nearly 300 people.

Special Services and Products. Dissemination of technical information to specific audiences is carried out through the NAL education program. One-to-two hour seminars are presented to specialized USDA groups such as



Soil Conservation Managers. Approximately 25 of these short seminars were presented in FY 81, primarily in the NAL Educational Resources Center. Demonstrations of the AGRICOLA data base are held at meetings of professional scientific societies throughout the United States. An effective tool for dissemination of technical information to specific audiences is Agricultural Libraries Information Notes (ALIN), published monthly with an estimated readership of 25,000 cooperators in land-grant and private libraries and other educational institutions.

Current Awareness. NAL provides individual computer literature searches from nine major abstracting and indexing systems to USDA scientists and administrators under the Current Awareness Literature Service (CALS) program. In 1981 there were over 3,000 user interest profiles processed on a regular basis. CALS offers an economical and efficient means of providing USDA researchers with the latest pertinent literature appearing in scientific journals and similar publications.

International Cooperation. As part of its expanded program for cooperation with AGRIS (International Information System for the Agricultural Sciences and Technology), NAL increased its contribution of citations from 12,000 input work sheets annually in fiscal years 1976-1977 to 50,000 machine readable records annually. This increase makes the United States the most prolific of the AGRIS participants.











